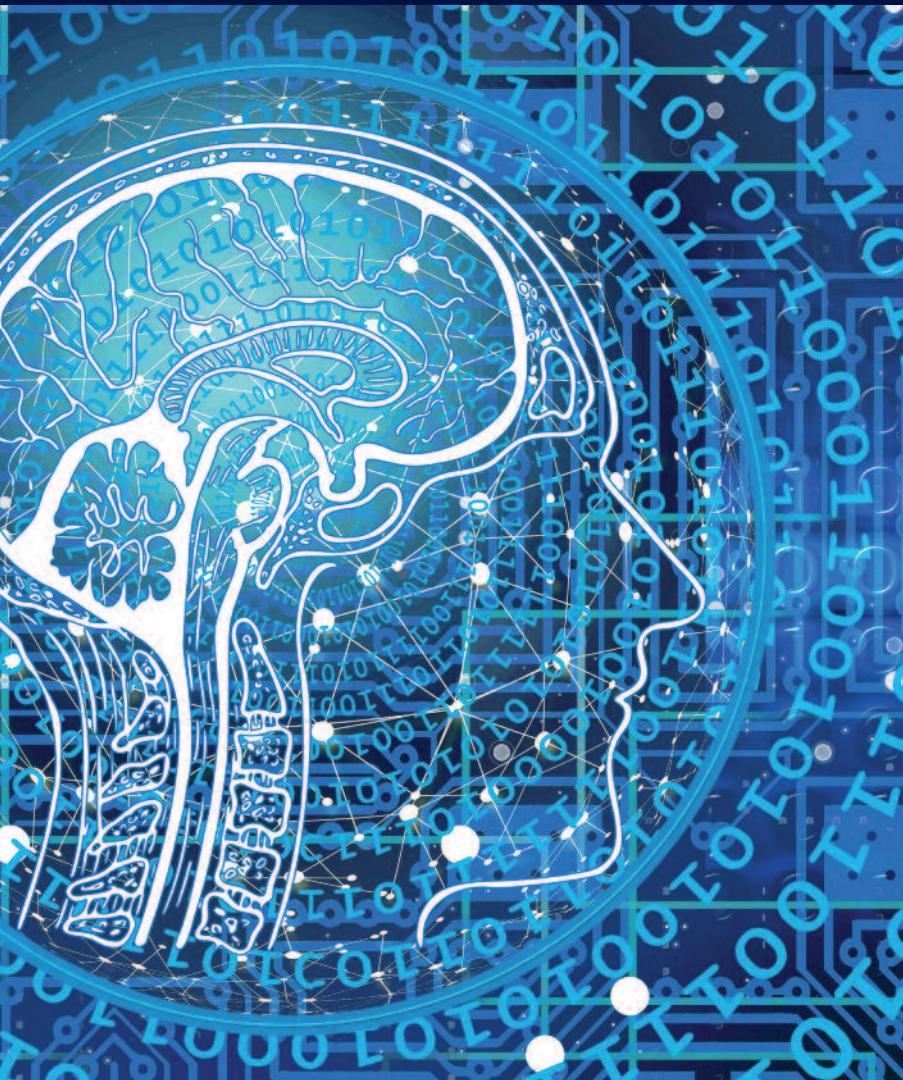


Readiness and Practice to Teach and Learn in a Digital World (RAP)



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About Readiness and Practice to Teach and Learn in a Digital World (RAP)

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Table of Contents

Introduction and Background

<i>Introduction and background to the study</i>	6
<i>Outline of the research</i>	7

Methodology

<i>Research design</i>	10
<i>Stage 2 - Survey development, data collection and analysis</i>	10
<i>Stage 3 - Focus groups</i>	11

Presentation and Analysis of Findings

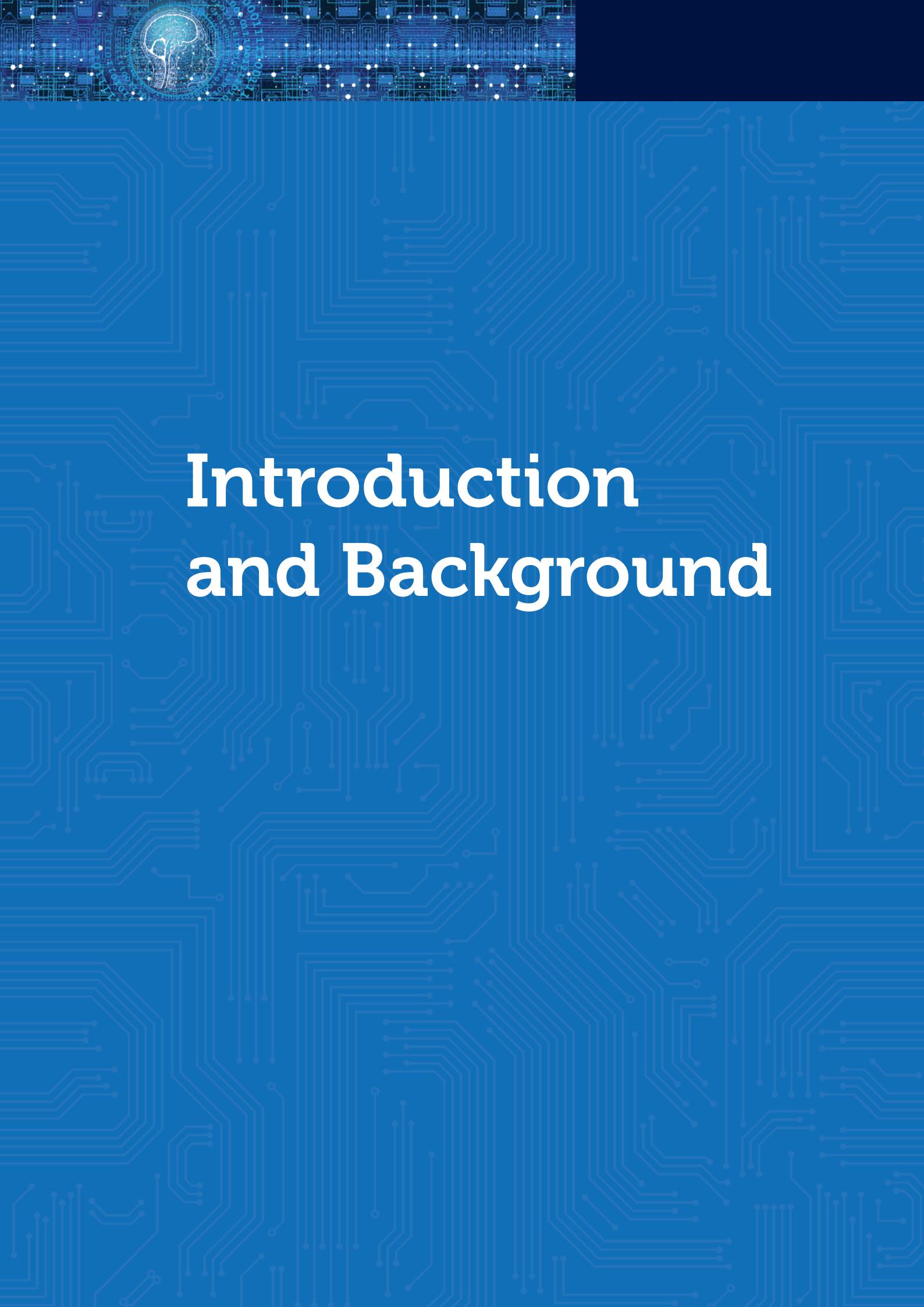
<i>Introduction</i>	14
<i>Background information about the student sample</i>	14
<i>Measures of technology 'readiness'</i>	15
<i>Survey comments</i>	21
<i>Student teachers' perceptions of ITE preparation in educational technology</i>	22
<i>Student teachers' experiences of the benefits of educational technology</i>	25
<i>Factors hindering or facilitating student teachers' use of technology on school placement</i>	27
<i>The role of the Co-operating Teacher in schools</i>	32
<i>Student teachers' feelings of 'digital preparedness' by the end of the ITE programme</i>	35
<i>Examples of ITE students' journeys in educational technology</i>	37

Discussion and Conclusion

<i>Discussion of findings</i>	40
<i>Conclusions and Implications for ITE Policy and Practice</i>	43

Bibliography	46
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Appendix	50
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Introduction and Background

Introduction and background to the study

The use of digital technologies to enhance the quality of teaching across the continuum of education has become increasingly important in most jurisdictions (McGarr and Gallchoir, 2020). Teachers are not only required to become active agents for change in implementing technological innovations, but also in their design (Roulston *et al.*, 2019). However, according to the OECD (2015), countries that want to deliver on the promises that technology holds in education, need to have a convincing strategy to build capacity and to become better at communicating this requirement and building support for change. With cause for optimism, in Ireland and Northern Ireland, various policy documents and strategies to enhance teacher competencies in the use of digital technologies have been proposed such as the *Digital Strategy for Schools* (DES, 2015) in Ireland that highlights the need to 'develop teachers' knowledge, skills and confidence to embed ICT more into their practice, particularly in courses developed as part of initial teacher education (ITE)' (p.31). In Northern Ireland, the General Teaching Council (GTCNI) also states that there is an aspiration for teachers to develop a knowledge and understanding of how to use technology effectively, both to aid pupil learning and to support their professional role, and how this competence can be embedded across all of the teacher competencies (GTCNI, 2011).

On the other hand, with cause for concern and the lack of research relating to the hindering and facilitating factors relating to the use of digital technologies by teachers (Thanaraj, 2012), there are many issues that Haydn (2010) among others are suggesting need to be addressed in order to reduce the rhetoric, reality gap of policy and practice in Teacher Education. These issues include, but are not limited to, the wrongly held assumption that young people today are digitally-savvy and 'at home', learning through the medium of technology as 'digital natives' (Prensky, 2001). However, Tondeur *et al.* (2017) point out that while there is an assumption that student teachers are proficient in the use of digital technologies, this is not always the case. According to Gao *et al.* (2011), only a minority of teachers at the beginning of their careers are competent enough to use digital technology effectively and many hindering and facilitating factors are involved. Furthermore, Slaouti and Barton (2007) are of the view that, at most, the majority of student teachers who use digital technology, restrict its use to preparation for teaching rather than using digital technology as a pedagogical and transformational tool in teaching and learning.

This narrow use of digital technology by student teachers can be attributed to a number of factors identified in the literature such as the view that teaching about technology in a one-time course within a pre-service program is not enough as collaboration with teachers and increased technology use in methods courses are also essential (Zipke, 2018). It may also be attributed to, in the absence of digital education standards in higher education, the haphazard view that 'teacher educators must model appropriate technology integration strategies for teacher candidates in courses, so the candidates in turn can effectively teach with technology' (Foulger *et al.*, 2017, p. 419).

Indeed, Hammond *et al.* (2009) found that teacher educators acting as role models proved to be a significant influence on beginning teachers' readiness for the future embedding of digital technology in the classroom. Admiraal (2017) also suggests that student teachers need role



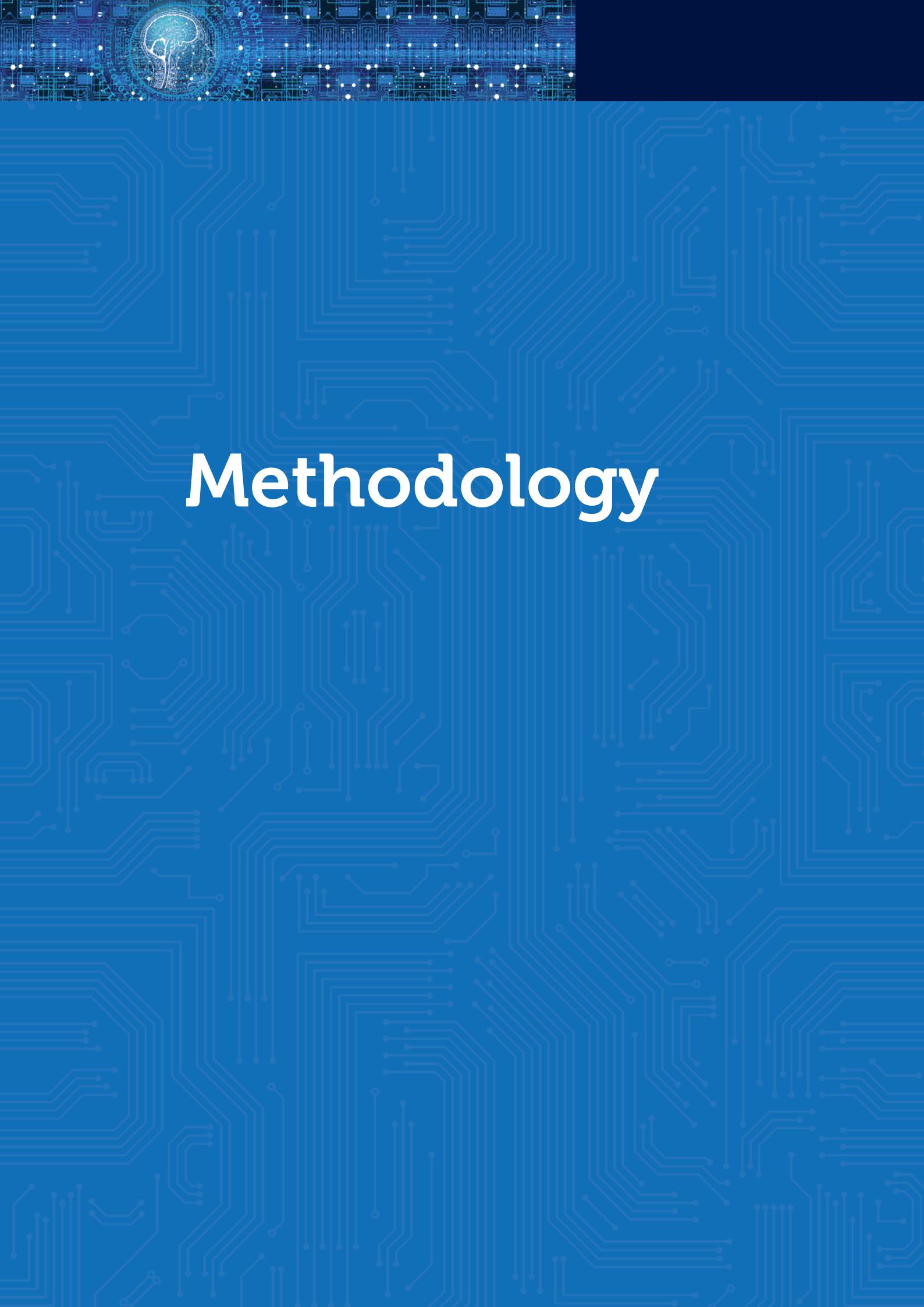
models for technology integration on two levels. Firstly by teacher educators in their teacher education programme who could act as a role model in how technology can be used effectively in subject teaching as these experiences will allow student teachers to implement such practices themselves (Polly et al., 2010; Tondeur, Pareja Roblin, et al., 2012; Wetzel et al., 2014). Secondly, co-operating teachers in schools can mentor pre-service teachers in integrating technology in their subject teaching (Barton & Haydn, 2006; Wetzel et al., 2014). However, the reality for many student teachers is a "praxis" or "transition shock" that is frequently encountered on school placement (Korthagen, Loughran, & Russel, 2006). This "praxis shock" is further compounded by the short-term placement of Initial Teacher Education students in unfamiliar schools and with unfamiliar mentors (Ambrosetti, Knight & Dekkers, 2014). To counteract these issues, the Teaching Council (2011) in Ireland has called for the development of 'new and innovative school placement models... developed using a partnership approach, whereby HEIs and schools actively collaborate in the organisation of the school placement' (p.15). Equally, the GTCNI and the Department for Education in Northern Ireland, also advocate a framework in the *Learning Leaders: Teachers as Professional Leaders* Strategy as a mechanism to encourage all teachers, regardless of their career stage, to act as change agents by sharing and leading innovation in their subject area or across the school or local area community. It is against this background of policy aspirations for the use of digital technologies in education that this research is based.

Outline of the research

In Ireland and Northern Ireland, there is a paucity of empirical evidence relating to the extent to which ITE students are prepared to teach through the medium of digital technology. To fill the lacuna of research in this area, the overarching purpose of this study, that commenced in September 2018 and concluded in January 2020, was to glean insights into how student teachers can be supported to embed digital technologies into their teaching and learning. More specifically, and building on previous research focusing on ITE tutors' use of technology in teaching and learning (Austin et al., 2018), this research used the voice of the student to explore how ITE students cope with the challenges and expectations of the digital classroom and how they have managed their own technological and pedagogical development as teachers entering the profession. The research centred on four overarching questions:

- What are student teachers' perceptions of pre-service tuition in Educational Technology?
- What are the hindering and facilitating factors that impact on pre-service teachers' use of technology in school placement?
- To what extent do student teachers reflect on their use of technology in the classroom?
- What is the role of the Co-operating Teacher in placement schools?
- To what extent do student teachers feel digitally prepared to teach in a digital world at the end of their ITE course?

The report begins with, as described in the preceding section, an overview of the hindering and facilitating factors relating to the use of digital technologies in education. Leading on from this, the methodology used in the study is described. Next, the penultimate section of the report provides a presentation and analysis of the research findings. The final section provides a discussion of research findings with recommendations and implications for Initial Teacher Education Policy and Practice in Ireland and Northern Ireland.



Methodology

Research design

This study used a multi-method design that consisted of four distinct phases (Figure 1). The first stage, as described in the previous section of the report, consisted of a systematic literature review and documentary analysis of official government policies in Ireland and Northern Ireland relating to the potential hindering and facilitating factors in the use of digital technologies across the continuum of education. The next stage of the research consisted of the development of a survey that was administered to all student teachers that were training to become primary and secondary level teachers in four Initial Teacher Education (ITE) institutions in Ireland and four in Northern Ireland. The third stage consisted of series of one hour focus groups with ITE students who volunteered to participate in the research during stage two of the study. The final stage consisted of converging the previous phases to form an overall interpretation of the study.

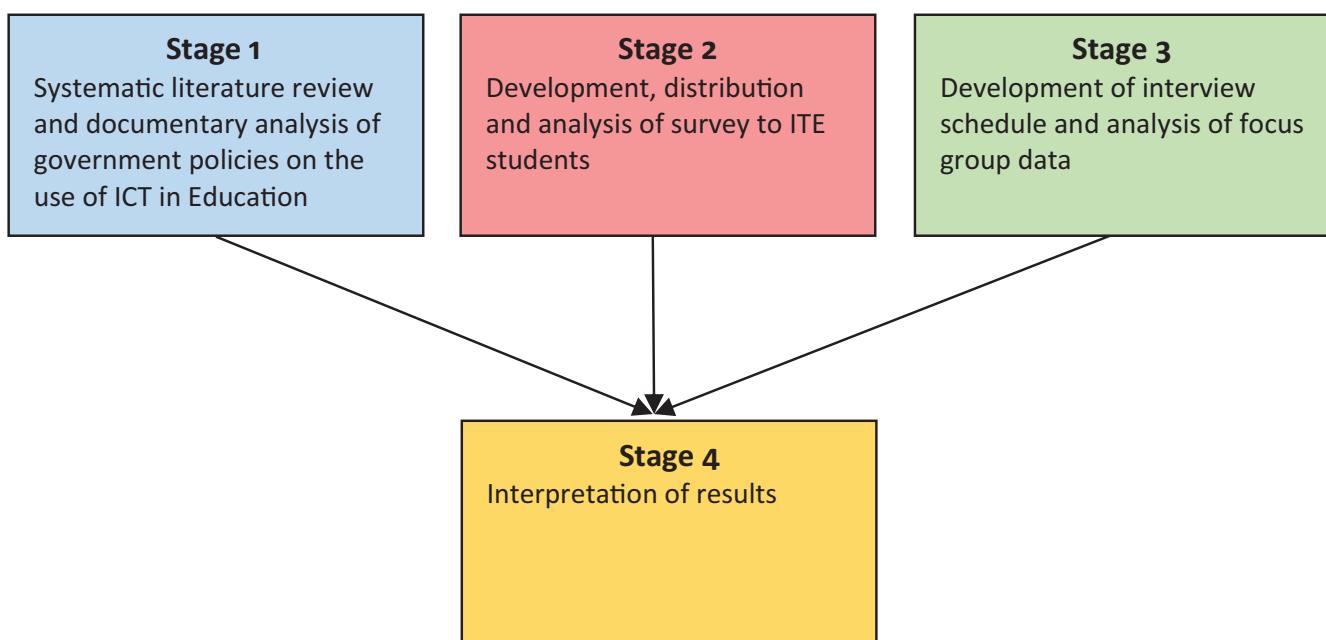


Figure 1: Multi-method design

Stage 2 - Survey development, data collection and analysis

Using items derived from Parasuraman's (2000) *Technology Readiness Index* (TRI), Dray et al. (2011) *Online Readiness Survey* (OLRS) and Matsko et al. (2018) *Co-operating Teacher Survey*, this phase of the research consisted of the development of a survey in order to ascertain:

- 1 The benefits and challenges for student teachers when using ICT on placement;
- 2 The technologies used by ITE tutors in university-based sessions;
- 3 The use of technology in teaching by student teachers;
- 4 The perceived value of technology in ITE teaching and learning;
- 5 The role of the Co-operating Teacher.



Exploratory factor analysis (EFA) was also used to verify the existence of the sub-scales (optimism, innovativeness and discomfort) which map to previous concerns expressed by pre-service tutors. In addition, EFA confirmed the Co-operating Teacher subscales transferred from the USA to Ireland.

Prior to their use in the main study, these adapted surveys were piloted in Ireland and NI with a sample of student teachers from the 2017-18 cohort in one institution and a selection of volunteers from non-participating institutions. Only minor changes to the phrasing in a few items were made based on the feedback. None of the pilot group commented on the survey being too long so no items were removed.

The next phase of the study consisted of a series of one hour focus groups with ITE students who volunteered to participate in the research during phase two of the study.

Data collection and analysis

A total of eight Teacher Education institutions, four on each side of the border consented to participating in the study with both primary and secondary education students included in the sample. Initial Teacher Education (ITE) students in the 8 institutions, who were within one month of completing their ITE studies, were invited to respond to an online survey. The survey also contained a covering letter explaining the ethical considerations and purpose of the research plus a consent form. A total of 192 valid responses were submitted, with almost equal proportions coming from Ireland and Northern Ireland. From this, descriptive statistics and exploratory factor analysis was used to allow a profile analysis of the data and statistical testing to be completed.

Stage 3 – Focus groups

This stage of the study consisted of three distinct phases. The first stage consisted of the development of an interview schedule that was used for all focus group sessions in order to ascertain:

- 1 The 'preparedness' of student teachers by ITE providers for using technology;
- 2 The technologies used by ITE tutors in university-based sessions;
- 3 The use of technology in teaching placements by student teachers;
- 4 The perceived value of technology in ITE teaching and learning;
- 5 The role of the Co-operating Teacher.

Data collection and analysis

In this stage of the study, smaller numbers of student teachers ($n=40$) from four of the institutions were invited to engage in a series of focus group interviews lasting one hour and critically reflecting on their university and school-based experiences. Where possible, an equal distribution of students from the subject areas was included and both primary and post-primary views were collected. Each focus group had 6-8 members and most groups were mixed by

subject and gender, all student teachers were keen to hear each other's experiences and so the focus group discussion was also a beneficial learning experience for them at this stage in their ITE programme.

These interviews were digitally recorded then transcribed and anonymised. Care was taken to ensure no institutions, tutors or individual schools, staff members, student teachers or pupils were identified either explicitly or implicitly from the reflections being made. In addition to questions based on the areas listed above, sub-categories existed such as reflections on how teachers learn to use digital technology, mismatches between what is taught in ITE digital technology sessions and what is used in reality in schools, and the connect/disconnect between the expectations of ITE tutors and school teachers/mentors or Co-operating teachers (CTs) in relation to how a student teacher uses technology were explored. Finally the factors influencing novel uses of technology were determined from both the ITE course perspective and schools' perspectives.

Following on from the transcription of the interview data, the data was read, re-read and examined through a process of data immersion/crystallisation which according to Borkan (1999) 'provides a means to move from the research question, the generated text and/or field experience, and the raw field data to the interpretations reported in the write-up' (p. 180).

The coding and analysis strategy for this phase of the study used a combination of Creswell's (2008) data analysis process and Miles and Huberman's (1994) 'Components of Data Analysis: Interactive Model'. The interview analysis for this phase of the study used conceptual labels in the first stage of the analysis by assigning and re-assigning a conceptual label to each unit of analysis. This was followed by assigning a specific code to each conceptual label to provide an overall interpretation of case study findings.

In the next section we firstly present the data from the survey results which provide an overview of student teachers' perceptions of their readiness and practice to use digital technologies in their school placements and future employment as a teacher. This is followed by reporting on the main themes that emerged from the analysis of the qualitative data. These, as the final discussion section indicates, provide some confirmation of the quantitative data while also suggesting that student teachers' perceptions of their readiness and practice to teach in a digital world may **not** be as positive as the quantitative analysis suggests.



Presentation and Analysis of Findings

Introduction

The overall aim of this project is to investigate Initial Teacher Education (ITE) students' perceived readiness to teach and learn in a digital world.

The key research questions are:

- What are student teachers' perceptions of pre-service tuition in Educational Technology?
- What are the hindering and facilitating factors that impact on pre-service teachers' use of technology in school placement?
- To what extent do student teachers reflect on their use of technology in the classroom?
- What is the role of the Co-operating Teacher in placement schools?
- To what extent do student teachers feel digitally prepared to teach in a digital world at the end of their ITE course?

The findings from the study are reported in the following sections.

Background information about the student sample

As Figures 2 to 5 show, the majority of respondents (71%) were female and aged 20-29 years old (86%). A small proportion (11%) was in their 30s and only a few students were 40+ years old. This gender and age profile of respondents is representative of the intakes of most ITE institutions both North and South where the 4 year B.Ed. students normally enter at the end of secondary school (aged 18 years) and PGCE/PME students are typically in their early 20s having already completed a three or four year degree programme. Only final year B.Ed. students were surveyed as the study wished to capture the student teachers' perceptions of their ICT skills at the point of completion of their pre-service education programme.

What gender are you?

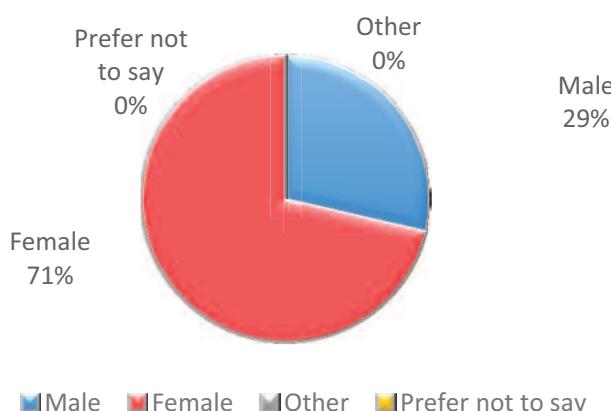


Figure 2: Gender

What age group best describes you?

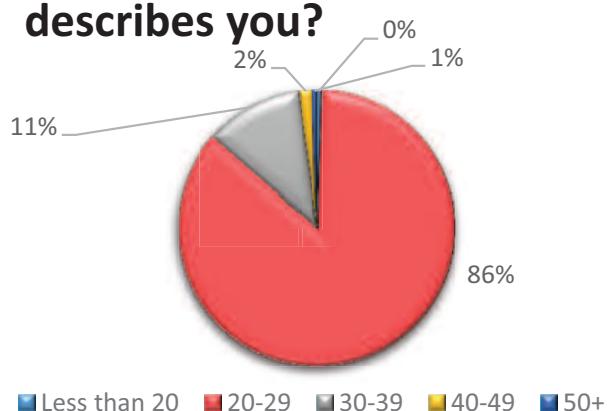


Figure 3: Age group

In terms of their subject specialism(s), the majority (64%) of respondents were not training to teach a STEM subject and almost one quarter (23.4%) were enrolled on a 4 year B.Ed. programme (focusing on Primary or Secondary education depending on the higher education institution at which they were enrolled).

Do you consider your major subject to be a STEM subject?



Figure 4: Subject Specialism

Proportions on each ITE Programme

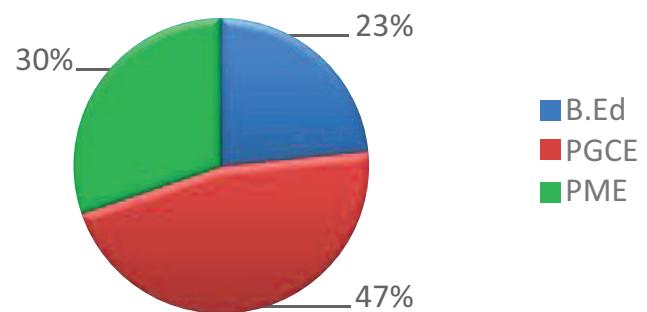


Figure 5: ITE Programme

Measures of technology 'readiness'

SPSS version 25 was used to provide the descriptive statistics and any inferential statistics based on comparisons of valid and reliable measures of constructs. An exploratory factor analysis (EFA) was used to verify the existence of the sub-scales as the TRI and OLRS items had been adapted for the context of new and emerging technologies in pre-service teacher education. Inferential statistics were used to determine if there were any differences in the subscales mean scores between primary and secondary student teachers, between North/South student teachers or those enrolled in different ITE programmes, and by various subgroups of the sample population as identified from the biographical statistics.

Factors	No. of items	Cronbach's alpha	Mean score
Optimism	6	0.752	3.563
Innovativeness	5	0.700	3.101
Discomfort	14	0.831	3.013

Table I: Reliabilities of the 'Readiness' subscales

As in the ITE tutor survey, Exploratory Factor Analysis (EFA) revealed a three factor model accounting for 58.8% of variance. The subscales were a 5-point Likert scale ranging from 1 – Strongly Disagree to 5 – Strongly Agree and so mean scores in the range 3-4 indicate students are reporting just above 'average' levels of Optimism, Innovativeness and Discomfort.

The reliabilities of these subscales, reported as Cronbach's alpha in Table I, were found to be greater than 0.7 indicating a high level of internal consistency of the three constructs (Cronbach, 1951).

As each respondent had a profile of scores for the three constructs of Optimism, Innovativeness and Discomfort, a repeated measures analysis of variance (Profile analysis) approach was used to make comparisons across subgroups. These results are reported below.

Profile Analysis was used to establish if statistically significant differences existed by gender between the students' readiness to use technology as measured by the subscales. No significant difference by gender was revealed ($p = 0.107$) although it was noted that male student teachers were generally more positive about using technology than female counterparts. This is illustrated by their high average scores for optimism and innovativeness and a lower level of discomfort as shown in Figure 6.

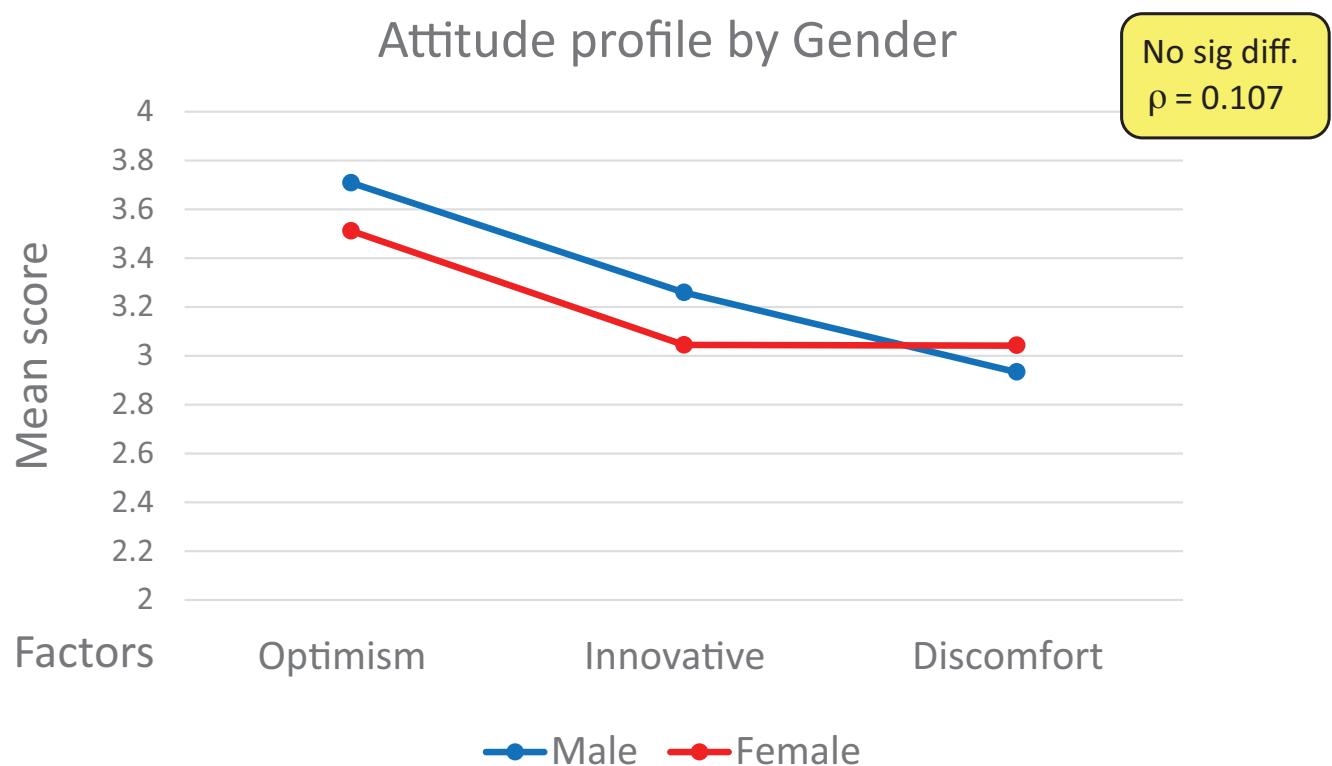


Figure 6: Profile Analysis by Gender

When all age categories were considered, a significant difference by Age emerged ($p = 0.041$) although the small number of respondents aged less than 20 or over 40 means these results should be treated with caution. In a follow-up investigation with only the two largest groups of respondents aged 20-29 and 30-39 being compared ($n=162$) no significant difference between the age categories occurred ($p = 0.055$). From the graphs in Figures 7 and 8, it is evident that the under 20s are much more optimistic and innovative than the other groups despite having a similar level of discomfort as those aged 20-29 and 30-39 years old. In contrast the over 40s have the lowest levels of optimism and innovativeness but more notably, they also have a very low level of discomfort indicating a sense of internal confidence and motivation to use technology in their classroom. These findings may be revealing a high level of commitment to engaging with the tools of the 21st century teacher.

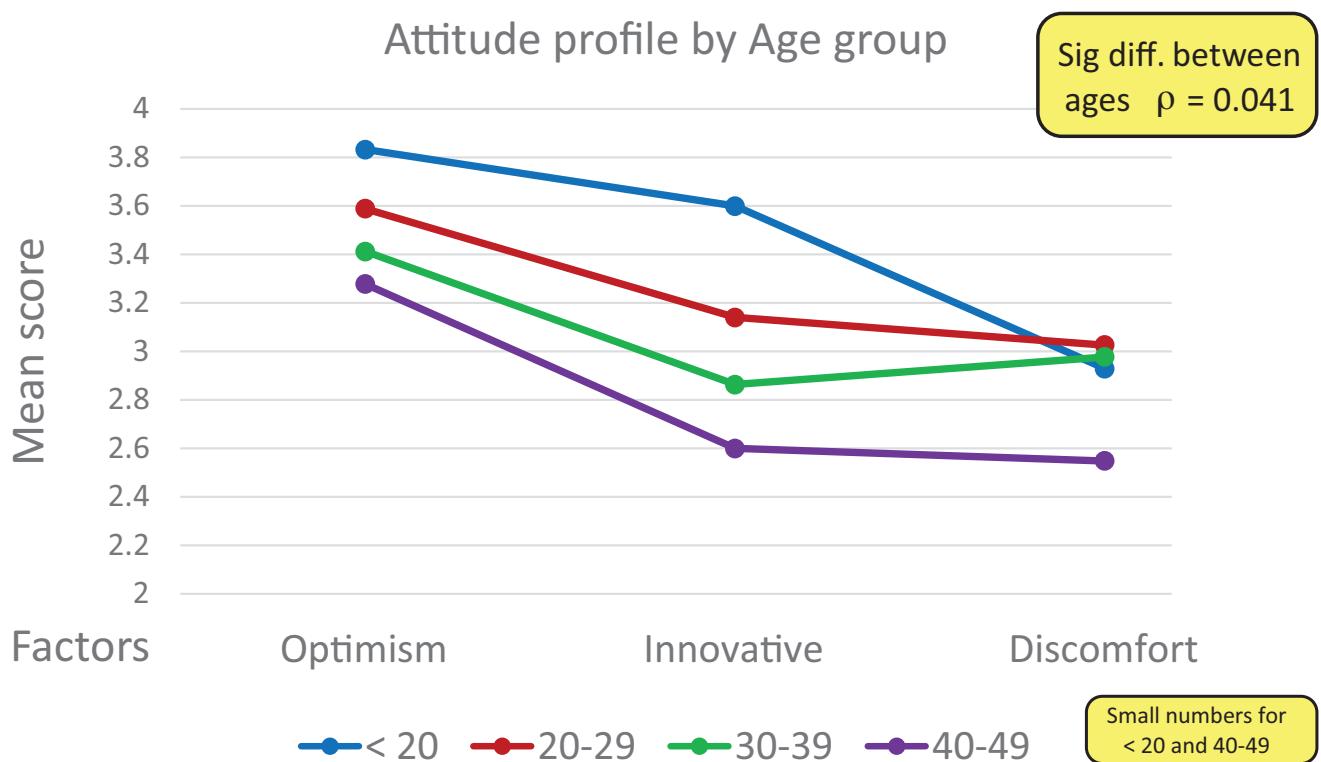


Figure 7: Profile Analysis by Age group

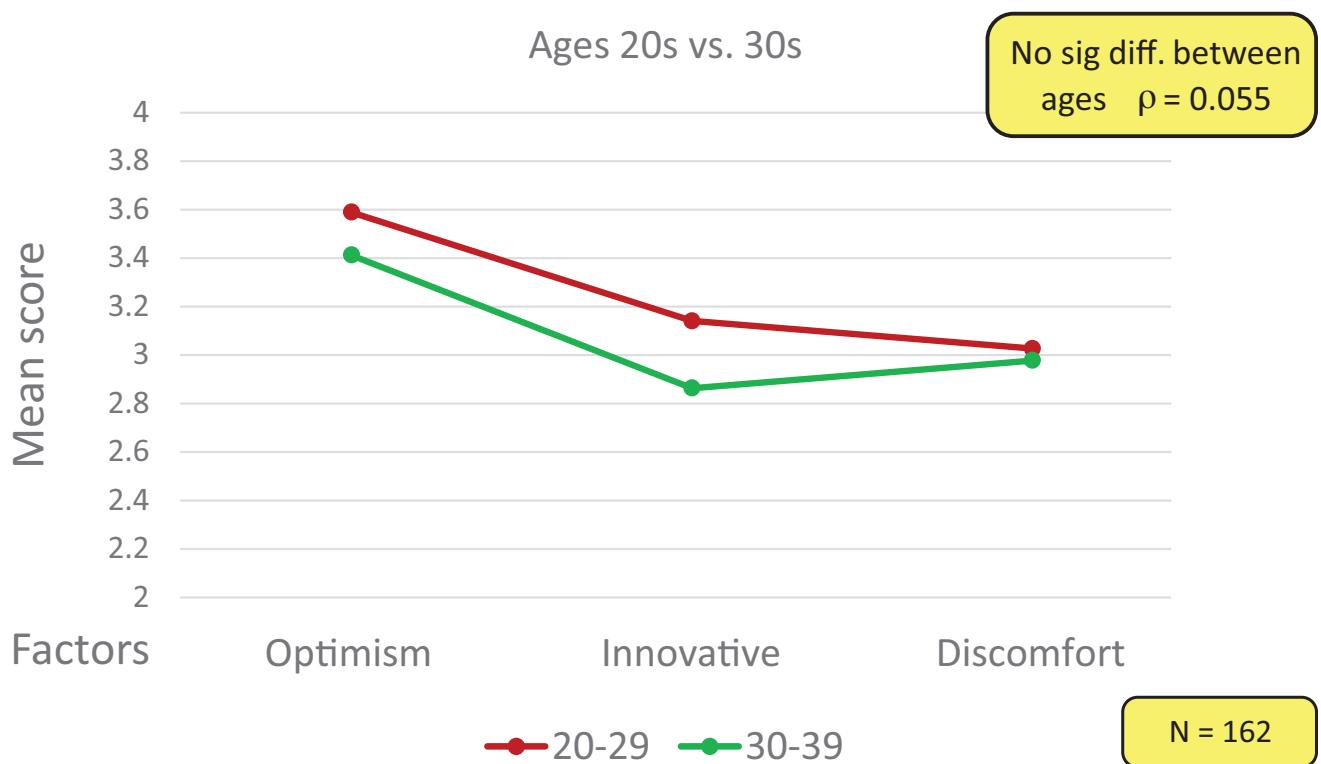


Figure 8: Profile Analysis by Age

As the research focused on student teachers' feelings of 'readiness' to use technology in teaching at the point of entry into the profession, the profiles of participants enrolled on the different ITE programmes were compared. Depending on the pre-service programme, whether PGCE, PME, or B.Ed. as measured by Years of Study, differences in attitude by programme could be established. There was no significant difference by ITE programme ($p = 0.164$) across the profiles with all students reporting equal levels of optimism (Figure 9). Students in year 2 of their programme had notably lower levels of discomfort than all other students while those in year 4 of their course were most innovative so potentially embedding technology effectively in their pedagogical practice. One plausible explanation of this result could be the increased amount of time to experiment with technology combined with more confidence in generic classroom management skills which have been developed over the longer period of time in the school context and exposure to a greater variety of staff in school placements. This combination of experiences may be producing students with more realistic expectations of what they can achieve in the classroom based on observing current teachers' technology use for teaching and learning.

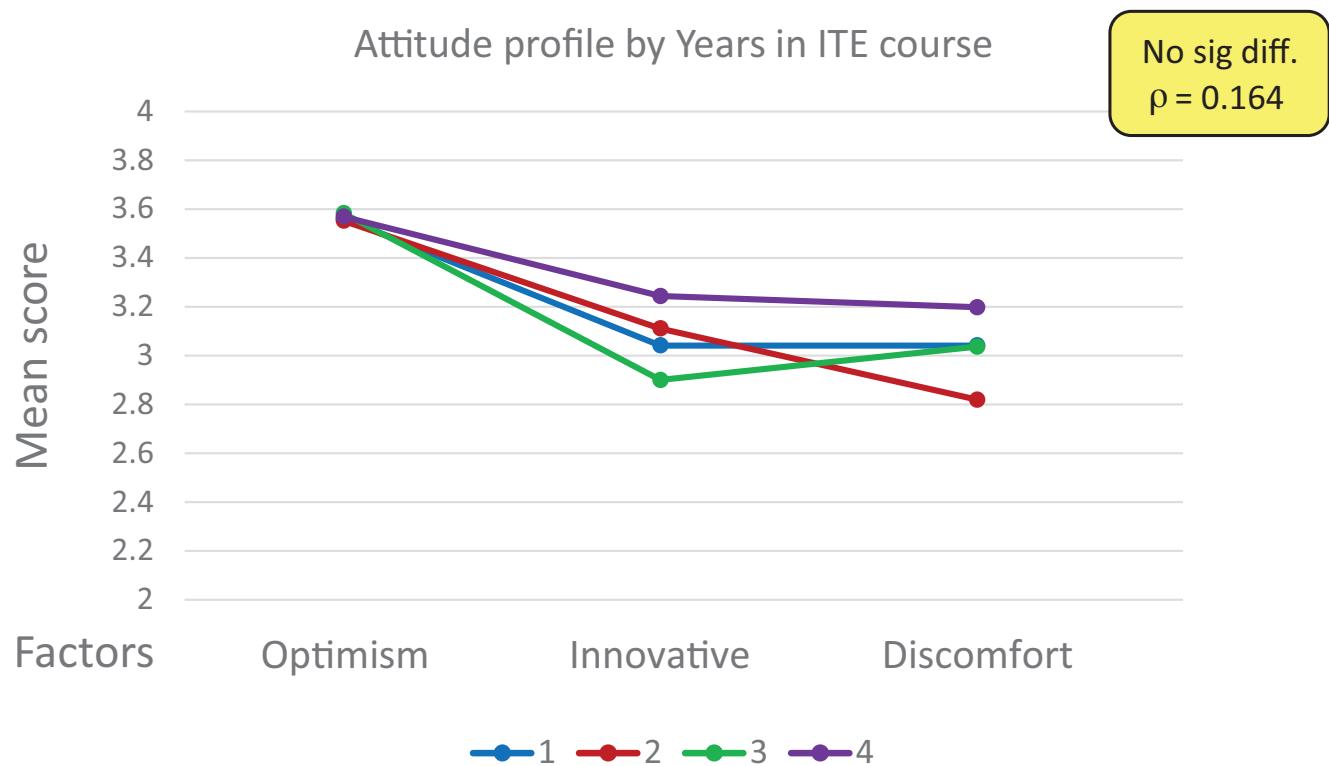


Figure 9: Profile Analysis by Years in ITE course

As before there were small number of students in the 3 year experience category so only those students clearly identifiable as being on PGCE, PME and final year B.Ed. programmes (Year 4) were selected for comparison, once again no significant difference occurred between these profiles ($p = 0.080$) – see Figure 10. For completeness only those students studying a PGCE and a PME programme were selected for comparison being the two largest subgroups in the study and both being Postgraduate qualifications. Interestingly their profiles were almost identical for Optimism and Innovativeness with a slight (0.2) difference emerging for Discomfort as shown in Figure 11. It was intriguing to note the lowest levels of Discomfort were from participants in the

2 year PME programmes offered in Ireland where a greater diversity of resourcing and internet access was reported. Nonetheless there appeared to be little negative impact on these postgraduate students.

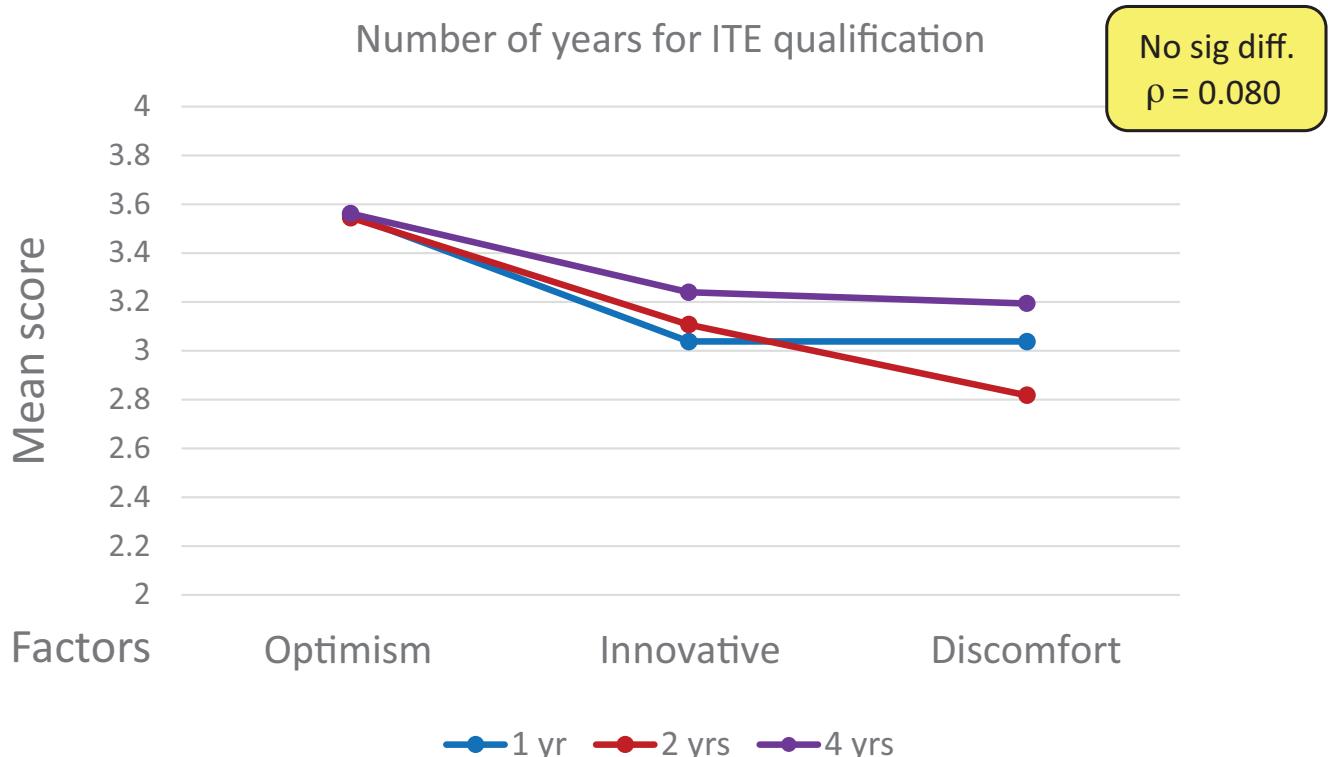


Figure 10: Profile Analysis by ITE qualification

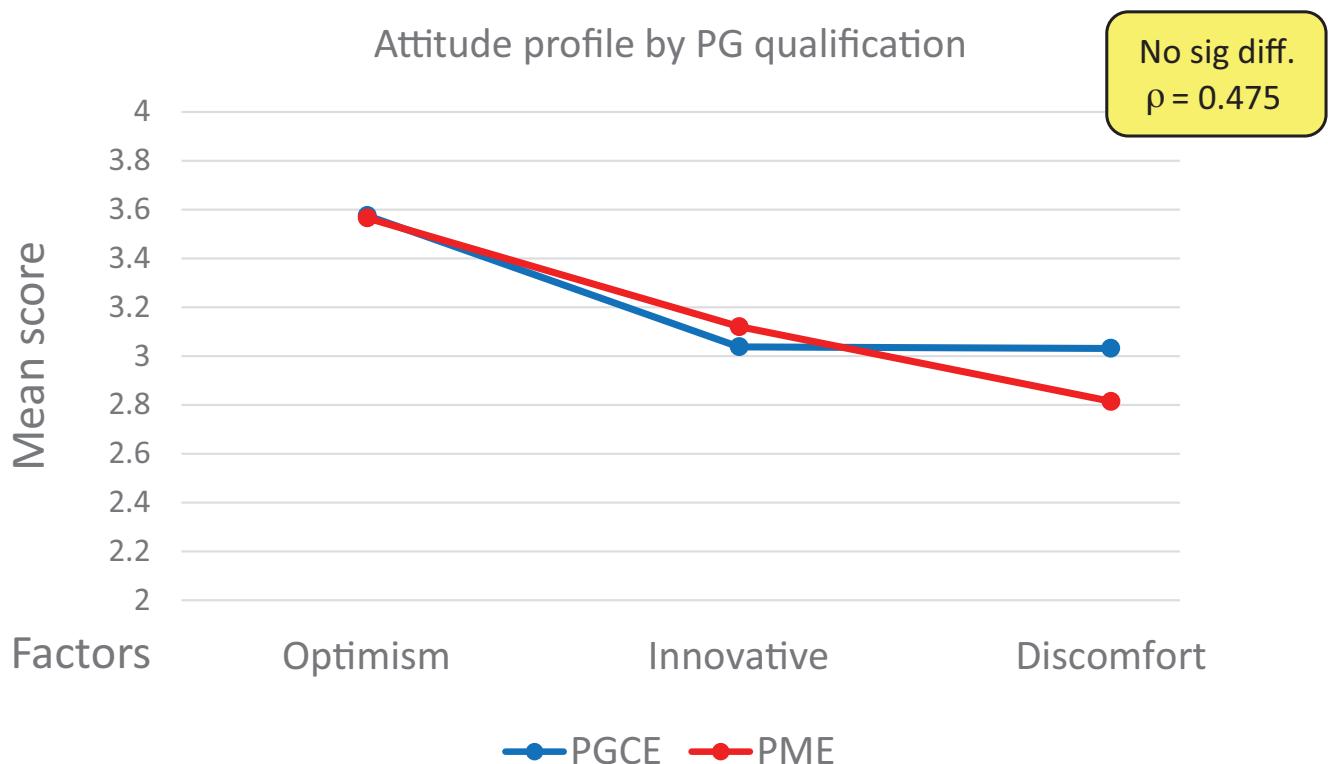


Figure 11: Profile Analysis for PG courses

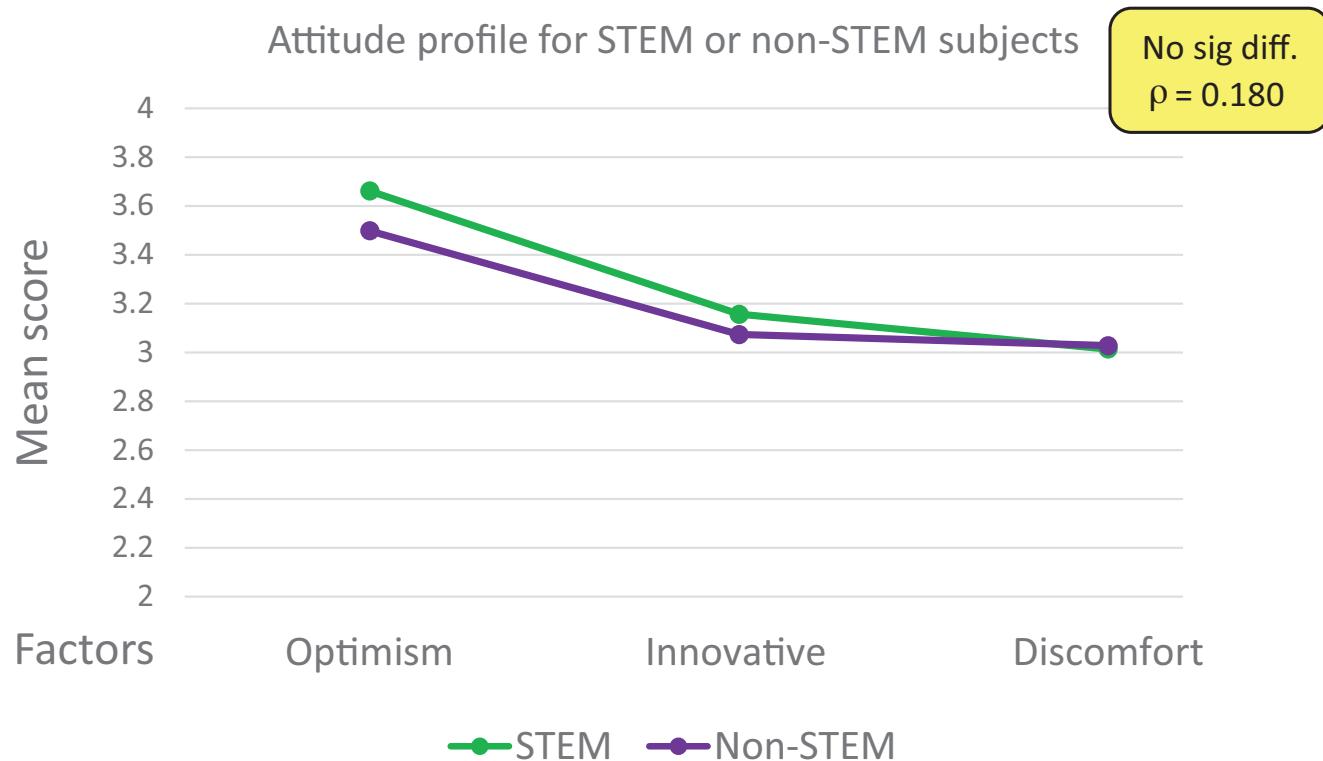


Figure 12: Profile Analysis for STEM/Non-STEM comparisons

As already stated, almost two-thirds of the respondents were studying non-STEM subjects as their major on the ITE programmes. Previous research by Austin *et al.* (2018) revealed ITE tutors in non-STEM subjects self-reported as being less technologically-savvy and confident than their STEM colleagues. To determine if this was impacting on the ITE students a comparison of the STEM and non-STEM students' profiles was conducted. As shown in Figure 12 the profiles were almost identical with only very minor differences in their levels of positivity in terms of Optimism and Innovativeness and no difference in Discomfort. Consequently, no statistically significant difference existed between the two subgroups of students ($p = 0.180$).

Finally, consideration was given to potential North-South differences based on the differing infrastructural arrangements in schools on either side of the border and also the availability/reliability of broadband wifi connectivity. As shown in Figure 13, no statistically significant difference existed between the jurisdictions and the students' levels of Optimism and Innovativeness were identical. In terms of Discomfort, the student teachers in NI were reporting higher levels of concern in this area than their Southern counterparts despite the reported unreliability of internet access in schools in Ireland. This finding was probed further in the focus group interviews with students at the end of their ITE programme as is discussed later.

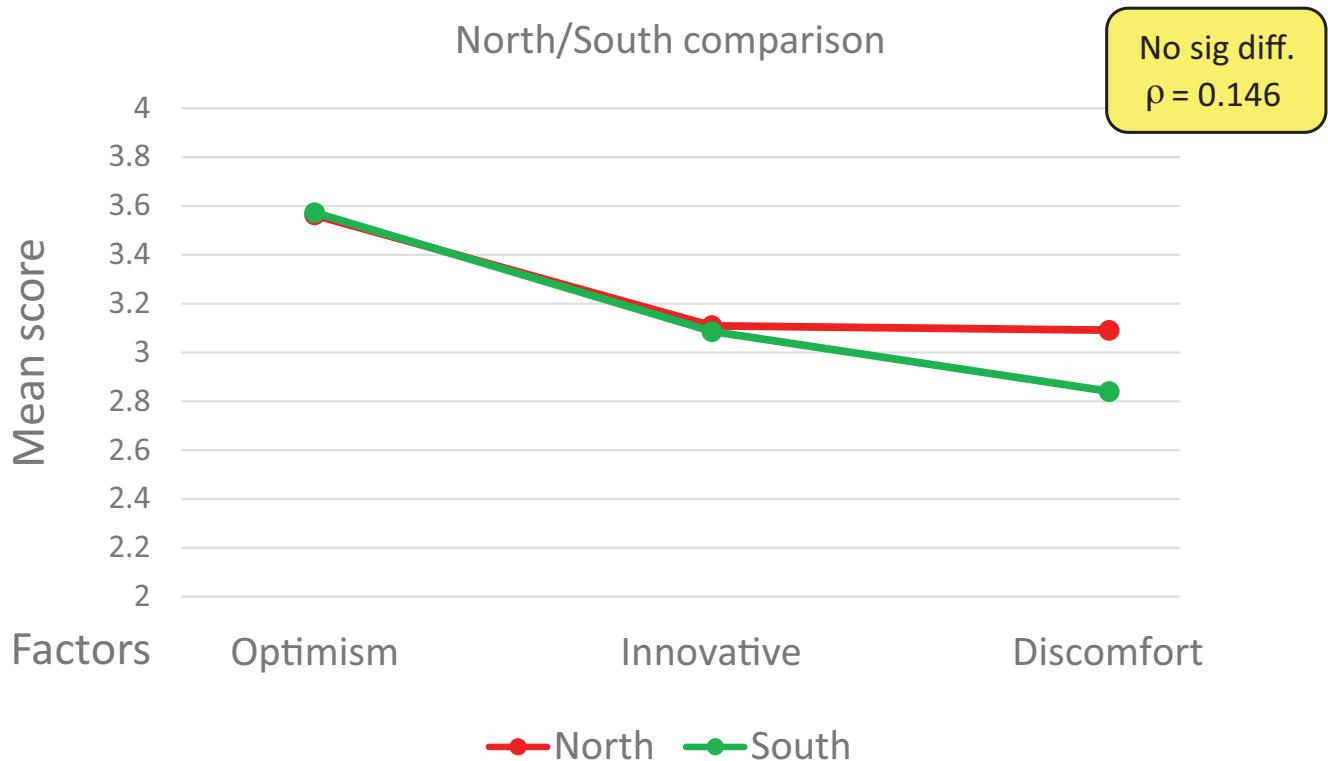


Figure 13: Profile Analysis for North/South comparison

Survey comments

At the end of each section in the survey the student teachers had the opportunity to add comments or further clarification of their survey responses. For the case of B.Ed. and PME students, a number confirmed that they reflected on all their school-based experiences to date and not just on their latest placement. In essence they attempted to accurately capture their collective 'learning' across the ITE programme. For PGCE students, the one year ITE programme meant a more intensive approach to teacher education was taken with relatively little time between placements to reflect upon their own professional development needs or achievements. As a result, there were fewer extended comments from this subgroup of student teachers than from those on programmes lasting two or more years. Although the overall number of comments in these sections of the survey is very low relative to the response rate, the challenges raised by these student teachers are nonetheless important and were investigated further in the focus groups and will be included in the findings.

Student teachers' perceptions of ITE preparation in educational technology

Data from the focus groups and survey revealed student teachers' perceptions of their training in technology in their ITE course, both in university-based taught sessions and on school placements, leading to their perceived 'readiness' to teach using technology. The Focus Group discussion initially uncovered the students' existing ICT skills prior to commencing their teacher education course before investigating the types and methods of delivery of digital technology skills and the pedagogical input that accompanied the ITE digital technology training sessions or Electives. These findings and those from the survey are reported in this section.

Prior to enrolment on ITE

Students arriving on the various ITE programmes came with pre-conceived ideas about the role of the teacher, how lessons would be planned and the role of technology in the classroom. Most student teachers drew on their own school experiences and focusing on presenting information to pupils: *"prior to starting my Initial Teacher Education [course] I felt that the only technologies that would be used in schools were powerpoints and projectors. I never realised that there were so many apps that can be used in teaching to enhance student learning."*

Other student teachers appeared to be focusing solely on the **creation of teaching materials** when they declared a 'readiness' to use technology from the outset: *"Yes, I already had quite a lot of experience using Microsoft Word, PowerPoint and Publisher. I already would have had quite a lot of experience using video editing software too."*

While some student teachers were unprepared for the 21st century classroom having no ICT skills and not realising they would be needed for a career in teaching: *"No, I wasn't prepared for using technology in the classroom. I never took any computer courses throughout my time in secondary school... My technological skills were well below average. For example, I didn't know what Microsoft Word was until college. My skills didn't improve either during my undergraduate course as the interest to improve my computer skills was never there."*

These issues were addressed during the ITE programmes with students declaring: *"However, during ITE I developed more resources and discovered more useful things to use within the class and became more confident over time."*

Digital skills development during ITE programmes

A discussion with the student teachers revealed generic ICT skills training and app familiarisation were frequently the focus of the ICT sessions in many ITE programmes - *"I think that we got a lot of information regarding the actual technologies, but I think it would have been beneficial to have more information on the use of IT in classrooms in method lectures as well."*

Evidence of pedagogical support and guidance on how to embed these resources into their lessons also occurred: *"During lectures we were notified of various digital technologies that could be applied in the classroom...he would discuss in great detail and familiarise everyone with the apps that were available for <subject> every week. ie Padlet, Edmodo, Kahoot! and so on."*



For the more enthusiastic learner, optional **Electives on Digital Technology** were offered to student teachers to address the deficit of subject-based pedagogical input and to invoke a 'readiness' to teach using technology: "*In my experience yes, absolutely ['ready']. However, that is only because I opted to get involved with an additional elective module on the use of digital technologies. What I mean is, if I did not choose to get involved then my exposure to digital technologies in the classroom would have been minimal.*"

For those not enrolled on the Elective, technology-enhanced learning was **personally driven** and so 'safe' options tended to occur (eg. use of You Tube): "*Not sufficient [ICT training] - no great emphasis was given but because I teach science subjects, I took the initiative myself to try and use ICT but my use was limited mainly to using You Tube clips . Which I know is quite limited.*"

Where subject-based tutors were involved in promoting the use of technology in the subject classroom, there was consensus that these **experiences were dependent on the tutor's proficiency** which was often lacking: "*It is random as to how proficient your methods lecturer is at using ICT.*" As a result, student teachers felt they would benefit from a guest speaker with responsibility for CPD in schools: "*If the methods lecturers are not good at using ICT then I think there should be time given to subject experts with ICT skills to come in and share their experience and knowledge of using digital technology in their classroom, give details on resources and where they found them etc. Don't get me wrong, our <subject> methods lecturers are good but they don't use technology a lot, which I find surprising for the subject.*"

Comments from the survey on feelings of 'digital preparedness' in ITE programmes

Opinions from the survey varied regarding the volume and quality of ITE provision in using technology for teaching purposes. With one student declaring "[My] course has not prepared me to be an effective user of ICT. Perhaps the course could offer an insight into a range of apps and resources..." and others saying "Very little taught in college, mostly just given names of websites/apps and expected to pick it up ourselves" and the "ICT course offered in university is not fit for purpose and very basic eg. making a PowerPoint. Doesn't teach anything we didn't already know." Indeed a recommendation that "ITE providers really need to review their coverage of new educational technologies; it is really not acceptable to expect teachers to pick these skills up 'on the go' anymore" sums up the negativity of the student teachers who voiced their thoughts in the Comments section.

In terms of being explicit about their concerns, for some student teachers, it was the class size at university that impacted on the learning experience – "The ICT workshops were too large to learn how to use the technology effectively." For others it was the limited content coverage leading to a misunderstanding of the breadth of cross-curricular ICT or a need to self study to extend their ICT toolset:

"I thought ICT was based almost solely on Scratch Junior. It would have been great to learn how to use the Interactive whiteboard and its related apps in preparation for school experience."

and

"Very few ICT tools have been shown to me during the course. Tools that were shown to me included digital platforms such as Google Classroom or Edmodo, or assessment tools such as Mentimeter and Kahoot. The other tools that I am competent in were tools I found and taught myself to use."

On a different ITE programme, a student felt an over-emphasis on technology existed:

"Technology is over-emphasised in the teaching of Education degrees. If anything should be changed the primary focus of the degree should remain solely focused on the teaching and learning aspects of classes, to focus on students, rather than the potential tools/gadgets to use in the classroom. In subjects such as STEM subjects, rather than simulate examples on screens, we should be taking classes out into the real world and simulate the examples there instead."

While another student questioned the usefulness of the focus of the training and the need to address the administrative packages too: *"We have had lectures on the use of apps available through the MySchool, Fronter, Google Classroom but I have not used these while on placement and am not sure how many schools are actively using them. I would have found more information on systems in use in school such as SIMS to be more practical as I had to learn how to use the system while on placement."*

The concern about engaging in 'on the job training' was extended further in a student's comment about her lack of confidence with interactive whiteboards:

"I would have liked training in the interactive whiteboard, as while they were in my previous school no teachers in the department used them and had little knowledge. I asked teachers in other departments and they gave me 5 minutes here and there but I felt uncomfortable incorporating it in lessons because the teachers were other side of the school in case something went wrong."

The general opinion appeared to be **more could be done** in ITE to develop all students' digital skills during the ITE programme as the students did not feel 'ready' and 'prepared' to use educational technology – sometimes from a digital skills perspective and other times from a digital pedagogy perspective. However some student teachers advocated nothing prepares you better than **your own 'practising' and 'resilience' to establish what works for you**: *"I think ITE courses can only act as a guide, alert students to what apps they can use, but from there really the main learning will only take place if the student teacher goes away and tries the app out at home themselves or in the classroom."*

Not all students felt digitally unprepared, the more technologically orientated ones were very satisfied with the ITE provision and felt empowered to try out new ideas themselves: *"I think ITE gave the optimum amount of guidance in digital technology in my subjects."* Similarly some students from the survey also revealed their confidence and a 'readiness' to enter the classroom: *"I am happy with my overall skill level regarding ICT tools"* while another declared *"I would be into technology outside of my course so this has definitely given me a good base knowledge."* The lack of comment from the majority of survey respondents may be read as an indication that more were generally content with their ITE course provision in ICT skills and pedagogy, and felt reasonably 'ready' for classroom practice.

Student teachers' experiences of the benefits of educational technology

Student teachers both North and South recognised the affordances being offered by technology – to pupils and also as part of their role as a modern and effective teacher. The following two themes emerged:

Technology to promote pupil learning

For some student teachers, embedding technology in the classroom can engage and sustain pupils' attention - "*I have found that in my teaching career the students are often more engaged in learning when using technologies.*" However there is always the danger of 'edutainment' so teachers need to focus on pupils' learning – "*In my subject area technology helps to keep students interested but it doesn't necessarily help in their learning*" and "*There must be a clear purpose for use of technology in the classroom; as long as it supports student learning, it is worthwhile, even if there may be some struggles in getting the technology set up and running during the lesson.*"

A number of student teachers reflected on what they have seen in schools and appeared to be conscious of choosing technology when it is the 'best method' of teaching or if it offers additional learning experiences beyond those available in a more traditional lesson:

"Technology is useful when it enhances pupil experiences but sometimes I feel that technology is used for the sake of it when many pupils already have too much screen time. At times in my experience, some pupils display an addiction to technology and ignore other methods in expectation of technology. This is where I feel some good quality teaching and learning experiences are being missed out in lessons."

Although technology can also accommodate the more diverse pupil population in the classroom:

"While I agree with using technology to improve exam results, that is not my main focus. I use technology in the classroom so that students will improve their ICT skills and become more independent learners. Furthermore, it allows me to accommodate all learning styles in the classroom and further support students with additional learning needs."

Perhaps the greatest challenge being faced by student teachers is the knowledge that expertise gained in a technology now will be outdated inside a year or two and therefore student teachers need to accept they will be lifelong learners alongside their pupils. The next section considers the Teacher as a Learner of Technology regardless of their current digital competence.

Teacher as a learner of technology

Even the less digitally-literate student teachers showed a willingness to try to use technology as a tool for teaching often with the support of their pupils - "*Technology has been a good aid and has helped me in my teaching career. Basic technology has been enough to help me with teaching and if problems arise, students are always willing to help find a solution.*" The student teachers also recognised the need to have the pedagogical knowledge to use the technology purposefully in their lesson which may require some personal experimentation in advance of any classroom use:

In terms of freedom [to teach using technology], it relates to the individual teacher and their approach to their lessons. You've got to trust your class to use the technology in the most appropriate way but this comes with being educated with the technological device before you undergo a lesson."

and that future upskilling will be a necessity. There was consensus that all teachers will not necessarily be of an equitable level in their knowledge and use of technology. Technological change moves at a rapid pace and so "New technologies are only new for a very short period of time and then are either dumped for an upgrade or become something very useful somewhere. It's necessary for users of technologies to realise that the term 'new technologies' is subjective; someone may have NEVER used an iPad before and as such they would view it as a 'new technology'". However another teacher may have commenced his/her teaching career with iPads and would not view their use of an iPad as a novel or innovative teaching method.

By accepting that the individual teacher is the determinant in defining 'new technologies' it was also heartening to note that student teachers have an appetite for reviewing the latest gadgets to establish if they hold any educational potential. This thought process is in itself a high level skill as the student teacher needs to have a sophisticated understanding of the technology to make the curricular connections at all.

Desirable and future uses of technology

In terms of futuristic developments with technology, one student highlights "*There are vast benefits to using technologies in class settings; processes such as Afl can be undertaken very fluidly throughout the year without the need for bags of paperwork. The recording of pupil work during a unit of work can be used to support pupils at both group and individual level. Being able to let pupils experience real life environments/work places through the use of, for example, VR and AR will soon be universal...in 20-30 years offices may simply become VR forums, what are we doing to prepare the pupils of today for these possibilities?*"

While another student teacher reveals:

"I would like to use Skype or Google Hangout to teach languages but would wait until I was a fully qualified teacher. I'm not sure if I could ever use it in class due to GDPR. My technology usage in the classroom consists of encouraging students to use technology to create content. Students can create their own Kahoots! which they can upload onto Google Classroom and share with their classmates. I would like to use iMovie but am first learning how to use it myself before I introduce it into my practice. I feel like it would be a great tool for students to actively present their subject knowledge and represent what they have learnt in other forms - role plays, silent movies, etc."



Factors hindering or facilitating student teachers' use of technology in school placement

This section focuses on a range of factors which hindered or facilitated student teachers' use of digital technology in the classroom. In many cases the two issues are interlinked and may even complement each other when a solution is suggested.

Challenges when using technology on placement

Despite the average to good scores on the survey items, it was evident from the additional comments being made that number of student teachers were feeling frustrated and limited by the facilities or lack of connectivity in their placement school.

"A lot of the equipment in schools was state of the art when it was bought 5-10 years ago, but there is no budget for its maintenance, and so it is unreliable and out of date."

"Technology in schools is often out of date and unreliable. It has also increased frontal teaching in the schools I was in, because pupils did not have their own devices."

The challenges being faced were particularly evident in the comments about Irish schools' lack of connectivity:

"Using technology within a classroom can often be limited by the school you are in. Last year I used Chromecast and a tablet as part of my lessons. This year the school I am on placement in has no Wi-Fi and I cannot do this."

"In my school at the moment, certain areas of the school don't have decent internet connection. Some rural schools just don't have the infrastructure to cope with new technologies."

However, the student teachers recognised the need to be realistic in their expectations and to plan lessons for the classroom context in which they would be teaching rather than to impress their observation tutor:

"Depending on the circumstances in the school, technology can be fantastic or a hindrance. I would never overly rely on the use of technology because when it fails you, it means your lesson is largely lacking substance. However, my experiences this year with technology have been far more rewarding due to better conditions in classrooms for teachers than last year. In my first year of teaching, I was hindered by the fact that the overhead projector in my classroom worked whenever it felt like it, so I could never rely on it being in working condition when I taught."

The use of fun activities such as games, active learning and quizzes were highlighted as resulting in increased levels of pupil enjoyment, engagement while also impressing their observation tutors. But these suggestions were consistently qualified by the [limitations of the hardware in the school](#) – "you work with what you are given. You're not going to use something that you don't have." An issue that was repeated by many of the student teachers from ITE courses in Ireland. Schools were reported as having "a projector and there are loose wires and you have to bring your own laptop and hook it up [to internet] if it's on" and "in our school it depends on what room you are in ... some rooms have internet and some don't." In contrast student teachers in NI bemoaned the lack of an Interactive Whiteboard in some of their teaching rooms and "resorted to the 'old school', data projector and powerpoint for those classes"!

In addition, student teachers perceived school teachers as having low expectations of their capabilities when using technology and so, for some less confident student teachers, they were able to opt for the 'safe options' and make limited use of technology, often for low level tasks or drill and practice (eg. revision websites or online quizzes). Many student teachers in Ireland reported perceptions of increased issues in classroom management or "being afraid to take risks" as the reasons for not embedding ICT into their lessons while the student teachers in NI purposely used the technology (such as iPads) with the difficult classes as a means of 'controlling' pupils' behaviour:

They [Pupils] were usually awful and you would be scared to get out the iPads, they'll start acting up. But they really engaged. So you were taking that risk, you don't know whether using technology will work or not."

"Sometimes you think, I am definitely not using the iPads here as there is so much discipline [needed] but then they [pupils] change when they see them."

"Sometimes the class finds the topic boring and they don't really care, then you bring in a game and they are the most interactive and they are so excited. Sometimes getting the iPads out- it's so beneficial for them."

Others noted the pressures of teaching exam classes with large quantities of content to be covered as the reason for not "wasting time using technology" as some experienced teachers failed to see the pedagogical benefits of Kahoot! quizzes or other formative assessment approaches:

"There was one teacher who said to me, "What are you planning on doing? Are you going to do games all the time like the last one [student teacher]?" It seems there wasn't that much learning going on. I did do some games and active learning, but at the end he said, there was fun but there was learning going on so there was a purpose. I think as long as they [teachers] can see that [learning] happening then they're happy."

Students can therefore feel constrained on placement rather than being supported in developing their pedagogical approaches, especially using technology:

"I did feel constrained as I really wanted to use Plickers, and I'd got all the cards ready. I downloaded everything onto my iPad, but they [teachers] weren't really happy for me to use it. And I did just feel a little bit limited in that way. I thought perhaps once, to find out, just to have the opportunity to do that. Kahoot! was similar in my second placement, I didn't get permission to use it so I did feel a little bit disappointed but you have to take what you are given."

In contrast another student recounted her visit to observe a teacher teaching with technology - *"I was with a teacher who, because the technology was there, gave them a Socrative and they [pupils] completed it, then a Quizlet and they completed it so they're tapping in silence. You think - she's not teaching. That was a GCSE class so maybe they want them to be more independent, but you walked into the classroom and you wondered what they were learning."* For this student, the challenge was deciding if this pedagogical approach was 'best practice' when using technology.

What technologies were used in school placements?

Some student teachers were highly complementary of the breadth of exposure to ICT that was provided on ITE Electives saying "*I think compared to other PMEs I was extremely lucky to get involved with digital technologies [Elective] and as such gained a bit of an edge in that regard.*" and "*[Uni] is providing us with a good education in this [ICT].*" However to what extent are the student teachers being introduced to new and innovative technologies or pedagogical approaches in their university modules which are raising students' expectations leading to disappointment if the facilities are not available when on placement? The potential **mismatch between taught sessions at university and the reality of the school placement** was viewed as a school-based issue. For some it was the lack of **hardware and facilities** - "*you have your projector and computer and you don't really go above or beyond it.*" For others there were "*two different types of mismatches in the two placements: one [school] wanted to use the technology and didn't have the resources and the other [school] had the resources but was constrained in how they used them in teaching.*"

The survey and focus groups revealed that student teachers on placement in schools North and South used **very similar educational technologies in their classrooms**. The following packages were mentioned frequently indicating applicability across subject areas and the primary-secondary stages:

- **Games/Quizzes:** Kahoot!, Quizlet, Socrative, Triptico;
- **Forums:** Padlet, Flipgrid, blogs;
- **VLE:** Google Classroom, OneNote, Fronter/EdModo;
- **Hardware:** IWB, iPads, Mobile phones, DVDs, Greenscreen;
- **Generic:** Powerpoint, Sway, Adobe Spark;
- **Subject-specific sites/apps** eg. GeoGebra, Book Creator, LinguaScope;
- **'Old school':** board and markers, projector, laminated flashcards and blu-tac, textbooks.

It is interesting to note the commonalities existed both North and South regardless of ITE provider.

How do student teachers learn about digital technologies suitable for teaching?

There was a general acceptance across the ITE courses that **mindsets** about educational technology in the classroom were changing, **opportunities** for using technology were presented, **apps were demonstrated in context** and **different sources** that could be used to get further information were provided. As one student teacher declared, "*ITE courses can only act as a guide, alert students to what apps they can use...the main learning will only take place if the student teacher goes way and tries the app out themselves or in the classroom*". So student

teachers generally believed that their professional development in using digital technologies in the classroom "*is something that we are individually responsible for ourselves, to go and research a bit more*".

Some student teachers enjoyed the formal recognition of completing an [accredited course](#) – "*Training to be a Microsoft Innovative Educator in my own time has helped me to learn about the ways that Microsoft software can aid student learning.*" While others relied on the more [social networks](#) such as "*word of mouth from peers ...discussing what we have used*" or "*mention of an app or website on Twitter*" and most frequently "*talking to colleagues in my school about the different apps available and trying them in the classroom*" to gain first-hand experience of their effectiveness for pupil learning. Where limited support or encouragement was available in schools or from CTs, the student teachers always acknowledged their "*tutors and methods lecturers*" at [university as a reliable source](#) for advice as well as fellow placement students.

Being [personally driven to try new ideas](#) was key to progression in pedagogical competence when using ICT - "*I took the initiative myself to try to use ICT but my use was limited mainly to using YouTube clips*" while also remaining responsible for your actions as a teacher – "*Even though technology is a must in the classroom because of the era in which we live, as a teacher you must use it correctly and tread carefully with it and not abuse it.*" Many student teachers commented on "*trying it out first, looking at it from a teacher and student perspective*" and knowing it is acceptable to "*incorporate ICT at my own pace, rather than feeling the need to include digital technologies into every minute of every class.*"

Summary: The factors impacting student teachers' use of technology on placement

Based on the above discussions, Figure 14 (top) shows the school climate and staff play a key role in positively impacting on a student teachers' experience of teaching. When a self-motivated and driven student teacher is placed in an IT-enthusiastic school the opportunities for using technology are embraced and shared (via Twitter or WhatsApp). A network of support is therefore established and utilized to gain more insights and ideas for educational technology usage. Social media such as Twitter and WhatsApp provide access to a network of teachers willing to share ideas, resources and expertise. It breaks down the boundaries of novice-expert teacher and inspires confidence. The peer and school based mentoring is informative and promotes professional development for both the student teacher and CT due to the knowledge exchange.

The bottom half of Figure 14 reveals the lack of hardware due to financial cuts impacts on the quality of the facilities available for teaching and may also reduce pupils' learning experience of softer skills such as online collaboration or researching global issues. Student teachers also reported the pressure to deliver the subject content to examination classes often results in a more in a traditional teaching style with little use of technology or open-ended, collaborative problem-solving tasks or independent online study to stretch and challenge these pupils. Negative factors also include a 'risk aversion' meaning student teachers 'play safe' with the lessons especially if they are being observed. Finally a poor internet connection is the main stumbling block preventing student teachers from accessing online resources, reducing the value of using online VLEs and blended learning or flipped classrooms.

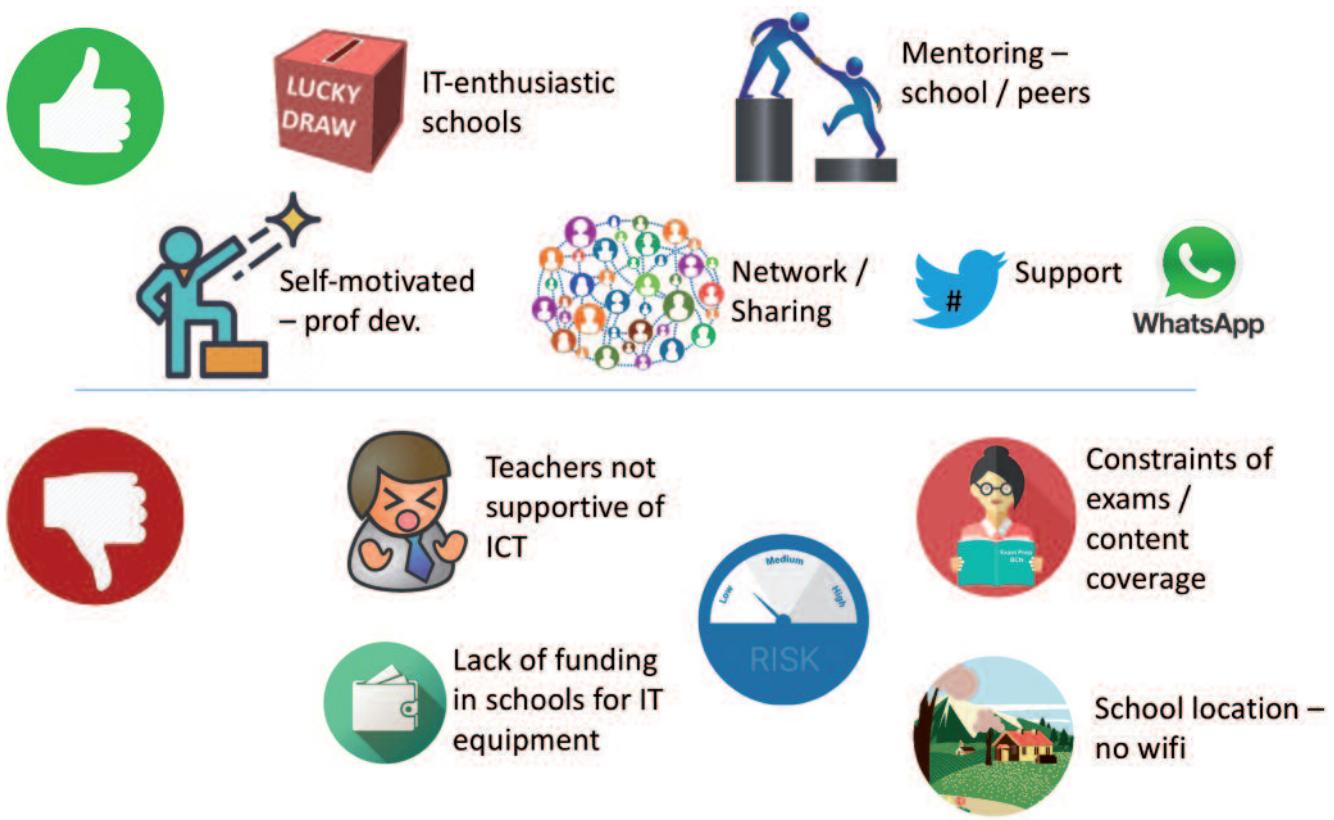


Figure 14: Summary of key factors facilitating and hindering classroom use of technology

It should be remembered that the student teachers are not alone in the classroom and that the partnership with schools includes an 'acceptance' to mentor and coach the student teacher being hosted in the department. So how did student teachers view the contribution from the Co-operating Teacher (CT) or other classroom teachers?

The role of the Co-operating Teacher in schools

Twelve items in the survey were identified as being relevant measures of the role of the Co-operating Teacher (CT) based on Matsko et al. (2018) *Co-operating Teacher* scale and therefore were adapted for use in uncovering the types of school-based support for student teachers' ICT professional development when embedding ICT into their pedagogical practice. As Table II indicates the two aspects of modelling and coaching, emerging from the Exploratory Factor Analysis, were reliable constructs ($\rho > 0.7$) accounting for 64.3% of variance. Mean scores for each factor equate to 'average' on the 5 point Likert revealing a possible mixture of practise in terms of the host school supporting the student teacher on placement.

Factors	No. of items	Cronbach's alpha	Mean score	SD
CT as a model	6	0.877	3.21	0.830
CT as a coach	6	0.854	3.03	0.828

Table II Reliabilities of the CT as a Model and a Coach

Items such as *I get the opportunity to observe my CT teaching using technology* and *My CT models best practice in the use of ICT in teaching and learning* illustrate the 'CT as a Model' demonstrating 'best practice' in the subject classroom when embedding technology seamlessly into their classroom activities. Items such as *My CT assists me plan for the use of ICT in the classroom* and *I am more likely to use technology alongside the CT* were mapped to the 'CT as a Coach' construct as they focused more on encouraging the student teacher to experiment with novel approaches, innovative technologies and more open-ended or project-based learning.

The Role of CTs towards the use of digital technology in the classroom

Not all students received similar or equitable levels of support from their CT as revealed from the comments in this section. One PME student declared "*My co-operating teacher is not involved in my teaching/not present in the classroom and does not meet with me about my teaching*" showing neither modelling nor coaching from that CT. Another PME student lacked modelling from his subject-based CTs but had found the Head of ICT in the school to be an excellent coach: "*Of my 5 CT, not one of them has had a discussion with me about the use of ICT in the classroom. It has never come up and I have never seen them use it (although I didn't not observe many of their classes). I have received incredible support from my school's head of ICT, who is not one of my CTs*". Another perspective was offered by a different PME student who found himself to be "*the most qualified person to use technology in the classroom*" in his school. This student benefited from observing the ICT leader in the school teaching using technology so experiencing the 'modelling' but found himself in the role of 'coach' to the other teachers in the school when it came to implementing a whole school adoption of technology enhanced learning or blended learning in each subject department: "*I have multiple CTs but also work with the ICT leader in the school and have run workshops on technology for other teachers in the school. I would be the most qualified person to use technology in the classroom but the ICT leader has made a name for himself and is also a big supporter of it. I have observed*



his lessons in order to gain ideas on using interactive whiteboards more and I have shared my own ideas on using sites like Kahoot!, Edmodo, Google slides. I have worked with him to create a team-based school system to organize the teachers in subject groups and to have a conversation space for each department".

These comments are particularly intriguing in light of the NI strategy for Teachers as Professional Leaders which advocates the role of student teachers in acting as 'change agents' in schools where modern, innovative or research-led practice is not being embraced: "Every teacher is a learning leader, accomplished in working collaboratively with all partners in the interests of children and young people". As King et al. (2019) put it in another context, "When mentors and schools were encouraging to pre-service teachers in their placements, this helped promote self-efficacy" (p. 14).

The reality of the student experience of CTs

Research reports that student teachers feel better prepared to teach when their CTs model effective teaching and coach by offering constructive feedback, encouragement and support, and collaborative activity while still maintaining the student's sense of autonomy in the classroom (Katsko et al., 2018). As indicated above, there was a continuum of participation and commitment from the CTs in the placement schools ranging from those who adopted a co-teaching role (and benefited from the new ideas the student teacher was bringing from their university teaching) to the more traditional 'overseer' of the placement as a whole (taking little interest in the day-to-day progress and development of the student teacher). This continuum is characterised in the comments from the student teachers:

"My CTs have been very supportive in my using new technologies in my classroom. They have been very welcoming and wanting to learn for their own development." For those departments who had hosted student teachers on previous occasions, it was evident they had aligned their practice to that recommended by the university tutors: "My CT used pretty much identical software to what certain lecturers would suggest" indicating a partnership between the school and the university in terms of promoting 'best practice' to the student teacher. In addition to raising the existing teachers' awareness of research-informed practices in the subject area through discussion and collaboration over lesson planning, the value-added by the student teacher to the department was often in the form of impromptu ICT demonstrations or training when the student teachers utilized an app in the classroom - "I used Triptico+ in order to play Word Bingo with pupils, several of my CTs had never heard of that."

However not all student teachers had a positive CT experience on placement: *"My first CT would have used quite old-fashioned websites, which most language teachers would not use any more."* While other student teachers reported a lack of ICT usage in their school apart from when it was listed in the Scheme of Work. In those cases, *"ICT was a tick box exercise"*, the activity was completed but *"there was very minimal exposure to computer use at all"*. The student teachers, both North and South, were conscious that *"It's all kind of assumed that you will use some kind of technology"* on placement and tutors observing your lessons will expect to see you engaging with technology – *"it's one of the GTCNI competences!"* and *"technology is a brilliant aid especially for differentiation"*.

Comments from the survey on the role of CTs in schools

As the earlier literature states, experienced teachers are faced with multiple challenges in the 21st century classroom. Student teachers in the survey reported:

"I have found in schools that most teachers are not confident in using technology."

"Technology can be very frustrating for teachers, especially if it is not simple to use"

This lack of commitment to the transformative potential of technology led to student teachers realising teachers' views could be biased: *"Kahoot! is generally considered to be a timewaster/lesson filler by many teachers in my school"* possibly due to teachers' lack of training in the package or not being aware that the pupils' results can be stored at item level as an Excel spreadsheet and analysed to allow for a more tailored lesson focusing on the areas of misconception identified by the quiz.

"The school you're in and students that you have, make a difference when utilizing technology, eg. the school may have all new technology and [internet] access, or not. Students might be focused and enjoy technology, or not. From the [action research] study I carried out there is definitely lack of courses and training available for teachers as well as lack of collaboration in regards to technology."

The effectiveness of the CT in schools was found to be person-dependent even within a single school where multiple CTs were available for consultation:

"To be honest, my CT doesn't support me too much in school, she doesn't really approach me to ask me how I'm getting on with classes. If I have any issues, however I can approach her. However, in the past, I haven't found her ideas to be very helpful. My other CT is extremely helpful and we are constantly communicating with each other regarding lessons and learning plans."

As discussed earlier, there was a wide variation in the technology available in placement schools especially in Ireland and added to this is the randomness of the ICT proficiency of the supervising teachers and the diverse attitudes towards technology by teachers and senior leaders in the school. For a number of the student teachers the following comment sums up at least one of their placement experiences: *"You know they are not being innovative or doing anything new. It's so dependent on the school and the person in the department."*

Student teachers' feelings of 'digital preparedness' by the end of the ITE programme

By the end of the ITE programme, most student teachers reported [high levels of basic skills](#) talking about "technology being part of growing up" and the ubiquitous nature of technology in their everyday lives. It is no surprise therefore that many had [feelings of confidence](#) in the potential of technology to support and enhance their classroom practice – "*I feel very confident in using digital technology in the classroom. It can be a great way to help students understand the trickier parts of the curriculum content and can be a change from a textbook.*" Others were quietly confident – "*somewhat confident in my efficiency with technology but would like to have improved more throughout the course and been shown technologies in use more*" - but not sufficiently comfortable with mobile technology that they would allow pupils to bring in mobile phones in the classroom – "*I see this as too great a risk, where it is impossible to have my eye on 30 screens at once.*"

Other student teachers, however, were resigned to the fact that they would be [expected to use technology](#) in the classroom – "*I'd have to use it but I wouldn't be confident in using IT at the moment*" and so were opting to 'play it safe' - "*I'd be fairly confident in what I do use but I don't overstretch myself and stick to what I know.*" Nevertheless there were student teachers who were still feeling [overwhelmed](#) both in terms of digital skills and also digital pedagogy at the end of the ITE course, saying "*I'm sure there's stuff out there but I just don't know how to find it*" and when they do locate the materials – "*I find I want to incorporate some technology into a topic but I am not sure how.*"

Many student teachers recognised the school placement as '[on the job' training](#)'. For some, they were implementing the good practice demonstrated by their ITE tutor at university – "[they] used pretty much identical software to what certain lecturers would suggest". While others were having to face the challenges head on – "*I had the experience of going into an iPad school and making a mess of it like everyone else and now I'm very confident with it [using iPads] but it's not as a result of the [University] training that you were given but instead, it's more on the job.*" In both cases the endpoint is the same, a feeling of confidence as they move forward to the next school, but the process of reaching this stage was smooth for one student teacher and a struggle for another depending on their ITE provider and school.

Some student teachers wished they had received [more practical guidance \(and less theory\)](#) at their university based sessions saying "*It's all very good taking down a load of websites but if you see them in action, you might be more likely to use it ... you'd remember it more if you've used it.*" Where opportunities were provided for Microteaching, in some institutions this was completed with technology so the student teachers could experiment with the use of IWBs, iPads, Google Classroom, VLEs and other online materials or websites in the safety of the university. In other institutions the student teachers were proposing this approach as an improvement to the ITE programme – "*I'm just thinking, in our Specialist subject we do Micro-Teaching and if it was the case that we were assigned a specific topic, a piece where we had to use a different app or something, share it, for different topics.....you'd have a mass of resources very, very quickly that worked.*"

The student teachers reflected on their continued willingness to adopt a 'trial and error' approach to [experimenting with technology](#) and determining what works best for them in their classroom or school. Across the ITE institutions, student teachers had used a range of VLE platforms with Google Classroom, OneNote and Edmodo or Fronter being the most frequently mentioned. Both North and South, iPad-Schools were discussed and emerged as "*a valuable learning experience*" and placement. However alongside all the positive comments about the benefits of technology, the [digital divide in schools](#) in Ireland was raised as a concern with large numbers of students discussing the lack of facilities in their classroom or across the school. To some extent the two year PME course offered an opportunity to ensure student teachers were placed in one school with good connectivity and an opportunity to practise technology-enhanced learning. In contrast the C2K Managed Service in NI, providing all schools with broadband connectivity and access to a core suite of licenced software applications, supported an equity of access during placements on the one year PGCE programme. The four year nature of the B.Ed. programmes both North and South facilitated a closer monitoring of students' experiences of technology on school-based placements.

When asked if they would accept a teaching post in a school with a strong history of using ICT and being innovative, some students jumped at the opportunity saying:

"I would apply as probably it's a school that is moving with the times."

"It's a good school if they're using ICT. It would be good to be there."

"I feel very confident with technology and I like using it, so I'm fine with it."

While for others the realism of high expectations of innovative teaching was causing them some concern:

"I would love it. When you're learning off all the other teachers and incorporating IT into your lessons, it would be brilliant! But I'd be worried I wasn't good enough. I think I may be out of my depth."

In light of their career stage in the teaching profession, the student teachers were at various places in their development of the use of technology in the classroom with all having made substantive progress from where they were at the start of the ITE course. As one student said: *"compared to that first question - where I was before the PGCE - I'm a lot more confident, definitely. Obviously there's areas where I think I need more guidance and more practise but really I think that's something that will develop as we go along, but with regards to a lot of things that I have used on placement, I feel very confident with them now."*

Examples of ITE students' journeys in using Educational Technology

The following 'ITE journeys' visually capture three students' progression in digital skills development over the course of their ITE programmes. Pedagogically there was a clear progression from Powerpoint presentations to pedagogical practices in the classroom and finally digital competency in the first example (blue pathway). The peach route shows the evolution of personal competence with technology. Finally the purple pathway maps the pedagogical progression of a digitally confident student teacher with good personal ICT skills through the pedagogical ICT skills stage to the final stage with whole class quizzes and online homeworks being used with ease.

In each case the personalised journey was facilitated or hindered by the variety of experiences and people to which they had been exposed during their ITE programme. It is therefore important to consider the role of all partners in the ITE provision to ensure adequate and on-going support is available to address the digital skills of our future teachers.

I felt that the only technologies that would be used in schools were powerpoints and projectors. I never realised that there were so many apps that can be used in teaching to enhance student learning.

I think that we got a lot of information regarding the actual technologies, but I think it would have been beneficial to have more information on the use of IT in classrooms in method lectures as well.

I feel very confident in using digital technologies in the classroom. It can be a great way in helping students understand trickier parts of curriculum content and can be a change from the text-book.

I wouldn't say that I'm an expert in it but I'd be confident enough...but it wasn't stuff that I learned in college but stuff that you're equipped with growing up with computers and stuff like that. Then when you went in to do your placement or whatever and learning how to turn on the computer or whatever.

We didn't do too much on ICT. It was sort of showing us different web sites like Kahoot and this is really good for doing that.

I probably do feel sufficiently prepared at the moment as I'm in a school where there is not much ICT being used but next year if I'm in a school e.g. that is using iPads, I might be a bit shown up in that regard as I've no experience of using iPads.

Yes, I would say that I was fairly confident in ICT and that anything, any new apps or programs, I picked them up reasonably easily. I think most people around our age, came with their own ICT skills.

We were given a lot of apps that you wouldn't have known about and stuff about <subject> learning. We even had someone come in from school who did a whole seminar on the current ways of using ICT in <subject> and gave us a sheet with all resources so that was really good help.

I personally feel very confident as I used it quite a lot in my first placement school. I learnt a lot about learning using iPads. I would have used Kahoot, Quizlet, Socrative, <subject> websites with IWB. I had experience of all of those. In my SE2 I didn't use ICT so much. There were iPads, but you had to go and get them. Then in my Special Needs School every pupil had a 1-1 iPad so it was great, I was using them every day. So I would say I was very lucky!



Discussion and Conclusion

Discussion of findings

In this study we were interested in how prepared pre-service teachers perceived themselves to be to use technology in their classroom practice. We found that there was evidence that many perceived themselves to be 'ready'. While their degree of readiness was not significantly different by gender, males were slightly more positive, as evidenced in higher scores for optimism and innovativeness, and lower scores for discomfort. Additionally, there was a suggestion that older respondents had increased levels of optimism and innovativeness, and lower levels of discomfort, which suggesting some levels of inner confidence and motivation to use technology in teaching. However, the low numbers in some age categories meant that some caution had to be exercised in drawing this conclusion. There was more confidence in the suggestion that the length of course had an impact on readiness to employ ICT, with the respondents on a four-year course more likely to have higher scores for innovativeness although, paradoxically, they also had higher discomfort levels. This might be explained as the combination of a willingness to use ICT, alongside a pragmatic evaluation of the challenges of ICT implementation in pedagogy in these students. Other aspects of the findings point towards the prodigious breadth of ICT that could be used to support learning and teaching, and so it may not be surprising that students on a more protracted journey to achieve qualified teacher status – four years rather than a single post-graduate year – have more time to become familiar with the ICTs available to support pedagogies, and the challenges of implementing them in many classrooms. While earlier research (Austin *et al.*, 2018) had suggested that non-STEM ITE tutors were less confident or knowledgeable about ICT than their STEM colleagues, this was not replicated in the pre-service teachers in this study.

Considerable research suggests that the attitudes of ITE tutors are crucial in preparing pre-service teachers to use technology (Hammond *et al.*, 2009; Polly *et al.*, 2010; Tondeur *et al.*, 2012; Wetzel *et al.*, 2014), and the student teacher comment that

"it is really not acceptable to expect teachers to pick these skills up 'on the go' anymore."

seemed to suggest that there was a need for explicit skill development with ICTs, and their implementation into classroom practice in Initial Teacher Education. Any expectation that pre-service teachers already have or are expected to pick up these skills themselves seems misplaced. The additional comments in the survey revealed that pre-service teachers viewed ICT as a tool for learning, analogous to an approved textbook, a good website or video clip. On the whole student teachers did not feel ready to use technology in their teaching based on the instruction offered by their ITE institution with many indicating the content was too dated or not relevant to their school placement environment. The respondents were aware of the need to ensure technology was enhancing or transforming the learning experience and not just a substitute for current practice. Nonetheless, there was an appreciation of the need to be 'realistic' evident from the comments regarding differing levels of access and reliability, particularly of wireless networks across schools, which impacted on some respondents' decisions to embed technology into their lessons.



There was a view, albeit from a small minority, that technology was 'over-emphasized' in ITE. This might suggest that some pre-service teachers got more exposure to ICT than they felt they required during their training. Whether this was because that respondent was unconvinced that ICT had a major part to play in *their* classroom and thus even a little attention to technology was more than enough, or whether they really got excessive coverage of ICT is unclear.

Arising throughout the findings was the question of the 'system readiness'. While Initial Teacher Education can prepare student teachers to use technology, and as we have seen that is not a given, students may be placed in schools which have unreliable provision and capricious interest in the use of technology. Even where the challenge is getting ICT preparation right in ITE, this may be largely wasted effort. Many schools lack adequate hardware and/or connectivity and some schools are not staffed by well-trained professions with personal convictions as to the value of ICT. Were Initial Teacher Education able to turn out ICT-ready entrants to the profession, they may enter educational environments where the use of ICT is perceived as 'timewasting', and that is unlikely to convince pre-service or newly qualified teachers to persist in its use. In schools with high levels of connectivity and ICT resources, the student teachers were keen to utilise all available opportunities to develop their pupils' ICT skills in the classroom with the ongoing support of the teachers. However, many student teachers were faced with the 'lottery' of school placement and the resultant 'challenge' of having to make best use of the limited facilities available to them in the school – both hardware and the lack of support afforded by formal mentors, perhaps in the role of Co-operating Teachers, and other teachers in the school. The focus group interviews provided further evidence that the values and degree of preparedness of schools impacted on the pre-service teachers' use of technology in their teaching. Where schools lacked equipment or did not demonstrate a strong commitment to ICT, this drove student teachers towards low-level usage. Fear of taking risks or the time pressure of a specification or content-driven curriculum were frequently cited as reasons for avoiding using ICT in some placement schools.

With just the very occasional dissenting voice, there was a broad acceptance by pre-service teachers that technology had a place in supporting learning and teaching, allowing more independent learning and appealing to a wide range of learners. However, there was a recognition that the pace of change of technology was constant, and that required teachers (and pre-service teachers and ITE tutors) to be constantly having to be aware of new technologies, and of having to evaluate and master these. The pre-service teachers in this study seemed to be developing an awareness of the sisyphian task this entailed. Burnout for teachers is widely recognised and Pillay *et al.* (2005) include "keeping abreast of technological innovations" (p.22) as one of the four pressures on teachers that they provide. Similarly, Ventura *et al.* (2015) suggest that "...the need to develop additional technological competences" (p.277) can be a cause of burnout.

The literature points to the importance of mentors in placement schools in supporting the integration of ICT by pre-service teachers (Barton & Haydn, 2006; Wetzel *et al.*, 2014). This study suggested that pre-service teachers experienced a variation in the quality of mentoring which encouraged ICT use. While some co-operating teachers acted as excellent mentors including in the incorporation of ICT into pedagogic practices, there were other instances reported where support for ICT use in the classroom was missing altogether or was derived from informal mentoring from other sources than the formal co-operating teacher.

Pre-service teachers often reported that they had been surprised, and sometimes a little overwhelmed, by the wealth of ICT which could be used to support learning and teaching. This was not always addressed effectively in ITE provision and whether a student had an ITE practice tutor that was proficient, or enthusiastic in the use of ICT, was 'random'. Some pre-service teachers recognised that *they* had some responsibility in developing their ICT skills independently, but most were expecting them to be integrated into skill development more generally in ITE. As ITE provision does not expect pre-service teachers to pick up, for example, pedagogical approaches themselves, it would be a surprising approach were ITE to expect ICT skill development to be the responsibility of the students.

Various models of practice in the use of ICT by ITE students in NI and Ireland were clear from the research. There were variations in the breadth and variety of ICT practices in schools, and these often had an impact on the extent to which ITE students felt confident and competent to embed technology into their classroom practice. The impact on the degree to which technology-led pedagogical practices are encouraged and developed within the ITE institutions to prepare students for the digital classroom was also clear. These reflect the findings of these students in the Initial Teacher Education institutions in this study, but many of the ideas shared by student teachers in the focus group, for example, would be applicable in other ITE institutions beyond those participating in this study.

Some student teachers reported the use of electives outside their main subject-specific courses in their ITE programme. These enrichment courses sometimes included considerable ICT, and much of this was innovative technologies such as the use of drones and mixed reality. Other student teachers without electives of this kind had little or no ICT training outside that which was delivered by their subject tutor. Looking at the two extremes, it is clear that inequities exist across subject areas even within a programme as well as between pre-service courses. Combined with the challenges faced when using technology on school-based placements, some student teachers will have very limited practice in utilising technology in the teaching and therefore limited pedagogical skills when leaving their ITE programme other than the skills they themselves have on entry to the course or that they pick up informally during it.

In short, the ICT journey can be very different for those coming with different degrees of ICT knowledge and confidence and it also depends on the degree of support from ITE and the quality of mentoring in this area in placement schools. The variation in the readiness of the system to accept and encourage pre-service teachers with ICT was also notable.

Conclusions and Implications for ITE Policy and Practice

The findings from the research can be used to stimulate discussion about both the current state of ICT work in ITE and future developments, internally and across the sector. The findings can feed into policymaking both at institutional level and also across the ITE sector both North and South.

From participating in this study, the students involved gained an insight into the use of innovative teaching methods which will stimulate their professional reflection on the role of a teacher. In keeping with the *Learning Leaders* document in NI, the students have experienced the importance of engaging with local, school-based research processes first-hand as a mechanism for professional development in the busy life of teaching.

The cross-border co-operation of the coordinating researchers is central to the project; previous work (Austin *et al.*, 2018; Austin and Hunter, 2013) showed that there is a wide divergence in ICT policy on both sides of the border. This study investigated whether these differences impact on the experiences of ITE students and if it in turn influences their ICT uptake in school placements and, by way of association, into their future teaching careers.

The primary beneficiaries of this research are the pre-service students in NI and Ireland who will be given a 'voice' to articulate their perceptions of the ITE course provision in terms of preparing them for the vagaries of school-based work. Others have noted that this voice has been missing (Thanaraj, 2012). By disseminating the findings, a broader insight into the uses of new and emerging technologies made by other institutions and the affordances that new technology can offer to ITE students can be achieved, to the benefit of future provision. The collaborative partnership across the institutions will provide a medium for the dissemination of innovative ideas and capacity building with ITE tutors.

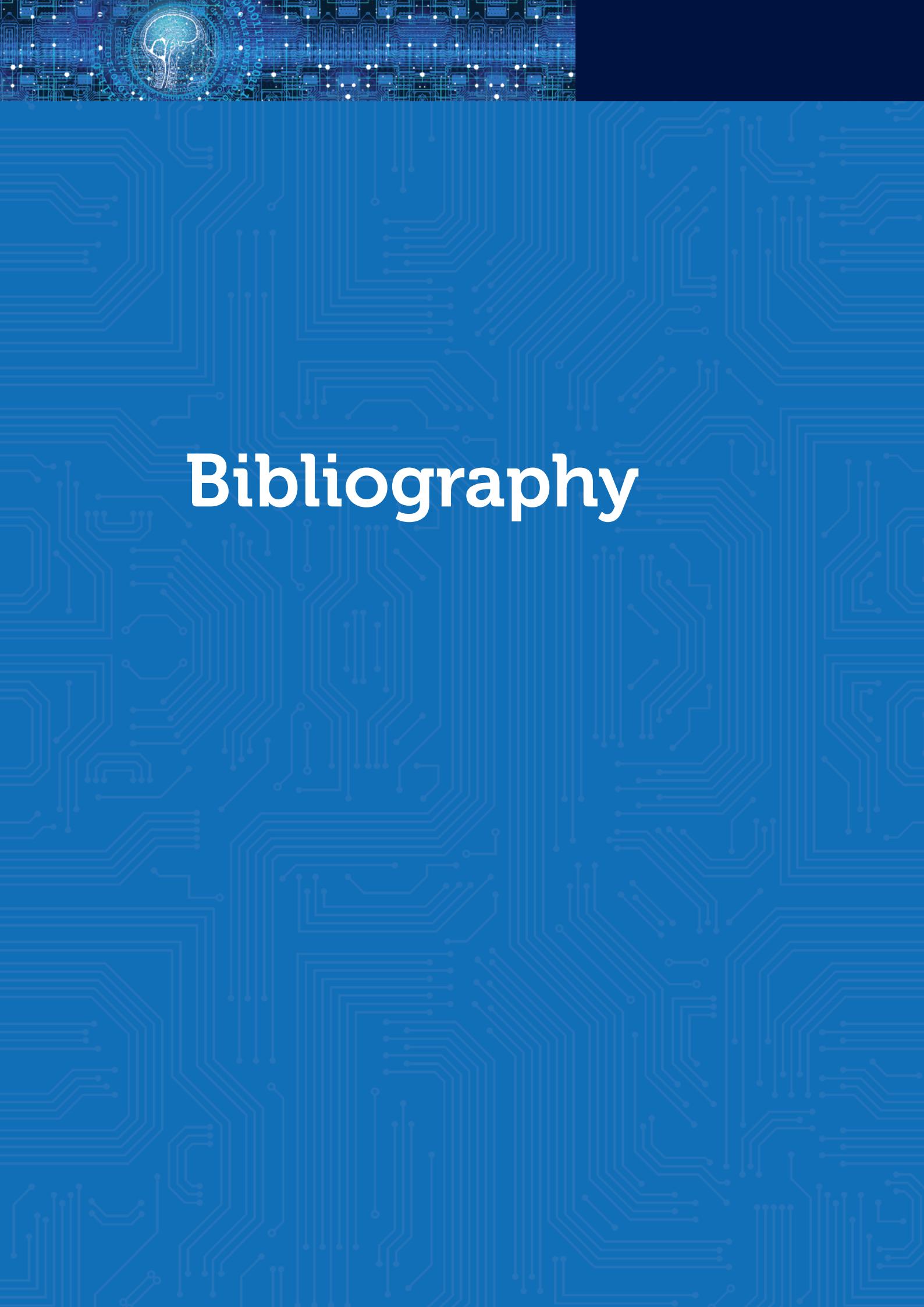
Pre-service teachers tend to have a clear vision for the use of ICT in supporting learning and teaching but a number of recommendations can be made to ensure that this has maximum impact:

There is a need for

- 1 the development of ICT skills in pre-service teachers to become further embedded across ITE with good practice and innovative uses more widely spread through encouragement and enabling measures;
- 2 all pre-service teachers, whatever their subject specialism, to get a broad grounding in the effective use of ICT to empower student teachers' learning; and
- 3 support to be given to schools, particularly through collaborative work with co-operating teachers when on school placement, to ensure that those pre-service teachers who have effectively integrated technology into their repertoire of pedagogic strategies are encouraged to use it, to take risks with it and to spread the benefits of it to existing teaching staff.

The last word however should come from a pre-service teacher:

"Using technology in a classroom is a tool that does not have to be used every day [but]...something to have in your arsenal for lessons. The benefits of technology [are] highly dependent on context. Questions about control are highly dependent on the teacher's management skills rather than the teacher's competence with the technology. This can tie into the fact that newer, experienced teachers have trouble using technology in class as their management skills haven't developed yet, but they are also the biggest supporters of technology in the classroom. How much one can use technology will depend on access."



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Appendix

Conference dissemination

Cowan, P., Brown, M., Roulston, S. and Farrell, R. (2019) *Readiness and Practice – An evaluation of Initial Teacher Education Students' Readiness and Practice to teach and learn in a digital world.* Paper presented at Educational Studies Association of Ireland conference in Sligo, Ireland, April 2019.

Farrell, R., Cowan, P., Roulston, S. and Brown, M. (2019) *Readiness and Practice: Sounding out Initial Teacher Education Students' Readiness to teach with digital technology.* Paper presented at the European Conference for Educational Research in Hamburg, Germany, September 2019.

Cowan, P., Roulston, S., Brown, M. and Farrell, R. (2020) *ITE Students' Readiness for Teaching and Learning in a Digital World.* Paper presented at the Mobile technology in Teacher Education (MiTE) in Galway, Ireland, May 2020.

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